Course: Planet Earth
PEIMS Code: N1120040 **Abbreviation:** PLNEAR
Number of credits that may be earned: 1

Brief description of the course (150 words or less):

Planet Earth focuses on the complex, dynamic relationship between the planet and its life, tracing it through the Earth's geologic history. Portions of the course include the emerging, integrative science now being referred to as Geobiology at the college level. The course is project-based with major components being a semester-long biodiversity study, a simulated senate hearing to evaluate extra-terrestrial impact defense, and geologic mapping exercises, through which students experience hands-on geologic and biologic field work. In fact, it is one the few courses in the Austin area that is being observed by the University of Texas Project-based Instruction class. This interdisciplinary, double-block, one semester course relies on reading and discussion of primary source material rather than a textbook, and writing and public speaking skills are enhanced through essay-writing and student presentations. The semester-long biodiversity study is a chance to complete authentic scientific research, hands-on and in the field.

"Civilization exists by geologic consent, subject to change without notice." Educated decision makers should understand the science underlying this quote from the philosopher Will Durant. Planet Earth provides the basis for this understanding and more. With a potential "nature-deficit disorder" in America's youth, recent natural disasters such as the Indonesian tsunami and Hurricanes Katrina and Ike, and pressing environmental issues such as global warming, Planet Earth is more relevant than ever. Students learn science in the manner in which most science was first learned, hands-on and in the field. As students examine organisms during their field studies, they see the variability that spurred Darwin and Wallace to recognize evolution in nature. As they make geologic maps, they discover the underlying principles of geology, as did Smith and Lyell before them. It is the gateway to advanced, integrated sciences such as Aquatic Science, A.P. Environmental Science, and Earth and Space Science.

Essential Knowledge and Skills of the course:

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Suggested prerequisites: completion or concurrent enrollment in biology; completion or concurrent enrollment in chemistry preferred. This course is recommended for students in Grades 10.

(b) Introduction.

(1) The major competencies to be developed by Planet Earth students are to:

investigate and analyze relationships between organisms and the physical environment; discuss, evaluate and debate competing theories orally and in writing; recognize and/or hypothesize about cause and effect relationships; read, interpret, discuss and construct maps, graphs, and charts;

read, critique and discuss journal articles and other primary source materials; collect and analyze data for a long- term research project; formulate conclusions based on data and research; use appropriate technology and specialized equipment for collecting and analyzing data; and present the results of research visually and verbally.

(2) The major concepts to be understood by Planet Earth students are:

the planet and its life is a complex, dynamic system; science is a collection of useful facts, laws, and theories and theories can be modified or abandoned; well-constructed, accurate documents communicate useful information; the pursuit of scientific research is influenced by political, economic and ethical considerations; quality work requires effort and revision; conclusions and theories gain validity with supporting evidence; and research without effective communication is wasted effort.

(c) Knowledge and skills.

(1) Scientific processes. The student, for at least 40% of instructional time, conducts field and laboratory investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:

(A) demonstrate safe practices during field and laboratory investigations; and

(B) make wise choices in the use and conservation of resources and the disposal or recycling of materials.

(2) Scientific processes. The student uses scientific methods during field and laboratory investigations. The student is expected to:

(A) plan and implement investigative procedure, including asking questions, formulating testable hypotheses, and selecting equipment and technology;

(B) collect data and make measurements with precision;

(C) organize, analyze, evaluate, make inferences, and predict trends from data; and

(D) communicate valid conclusions.

(3) The student knows the importance and origin of the Earth's biodiversity. The student is expected to:

(A) define biodiversity and identify the taxonomic groups that are its major constituents;

(B) evaluate the importance of and methods for surveying Earth's biodiversity;

(C) identify and analyze problems with measuring Earth's biodiversity;

(D) evaluate the role of the environment on the development of a unique biodiversity in isolated areas (Hawaii case study);

(E) examine and analyze the unique biodiversity of the Austin area and the conditions that influenced its development;

(F) define an ecological niche and define, recognize and evaluate the significance of different types of species interactions;

(G) evaluate the potential benefits of the most understudied taxonomic groups;

(H) analyze and evaluate the impact of nonnative species on biodiversity and the controversy surrounding them;

(I) examine a case study of a nonnative species and its impact on native biodiversity; and

(J) evaluate the use of biocontrol to control nonnative species.

(4) The student knows how to conduct field research that investigates the complex, dynamic relationship between the planet and its life. The student is expected to:

(A) compare and practice techniques for surveying the abundance and diversity of woody plants, birds, arthropods and soil organisms;

(B) select a partner, a study area and a group of organisms to investigate for a semester-long biodiversity project;

(C) describe the physical environment of the study area for the biodiversity project;

(D) formulate a purpose and hypothesis for the biodiversity project;

(E) design a data collection plan to test the hypothesis for the biodiversity project;

(F) collect and analyze woody plant, bird, arthropod and soil organism data for the biodiversity project;

(G) organize data according to variable tested for the biodiversity project;

(H) select and display data in an effective graph format for the biodiversity project;

(I) analyze data using graphs and charts to discern meaningful trends for the biodiversity project;

(J) describe trends in data and formulate plausible explanations using supporting scientific background research and field observations for the biodiversity project;

(K) evaluate the strengths and weaknesses of all phases of the biodiversity project;

(L) summarize purpose, hypothesis, methods and conclusion for the biodiversity project;

(M) display and summarize the original research for the biodiversity project in a visual format; and

(M) communicate the results of the original research for the biodiversity project in an oral presentation.

(5) The student knows the role of extinction in the history of life on Earth. The student is expected to:

(A) research and evaluate various theories on the possible causes of the K-T extinction;

(B) research and evaluate the possibility of Earth impacting extraterrestrial objects and the methods to prevent such events;

(C) debate the causes of the K-T extinction and the need for defense systems to protect Earth from extraterrestrial objects; and

(D) evaluate self and others on presentation skills during debate.

(6) The student knows the early milestones in the evolution and origins of life on Earth. The student is expected to:

(A) analyze the fossils of the Burgess Shale;

(B) evaluate and analyze potential causes of the Cambrian Explosion;

(C) evaluate the significance of the Cambrian Explosion;

(D) examine and evaluate key physical and biological changes on Earth during the Precambrian (making the Cambrian Explosion possible);

(E) compare and contrast various theories on the origin of life on Earth;

(F) examine the early Earth environment and evaluate its suitability for chemical evolution;

(G) review the characteristics of life and determine the requirements for biomolecule formation; and

(H) analyze and evaluate the results of the Urey-Miller and current experiments to recreate the origin of life.

(7) The student knows the relationship of the lithosphere, atmosphere and hydrosphere to all of the science concepts above. The student is expected to:

(A) use remote sensing to recognize and analyze surface features of the Earth;

(B) identify different types of remote sensing and evaluate their uses as a tool for studying the planet;

(C) examine and use the geologic time scale;

(D) interpret Earth history from examining rock layers;

(E) interpret the geologic history of the Shoal Creek area and evaluate geologic hazards associated with building at that location;

(F) interpret and construct topographic maps and profiles and geologic cross-sections;

(G) collect field data on the geology and geologic history of McKinney Falls State Park; and

(H) Interpret the geology and geologic history of McKinney Falls State Park.

Description of the specific student needs this course is designed to meet:

Students will investigate the complex, dynamic relationship between the planet and its life, primarily through a project-based format with an emphasis on field investigations.

Major resources and materials to be used in the course:

Major resources include aerial photos, topographic maps, geologic maps, binoculars, transect lines, insect collecting equipment, field guides, computers; optional: GPS receivers, and GIS software.

Required activities and sample optional activities to be used:

The major project-based activities for the course are:

Semester-long biodiversity field study

Simulated senate hearing on the Cretaceous-Tertiary extinction event and extra-terrestrial object defense systems

Shoal Creek area geologic hazards field trip and analysis project

McKinney Falls State Park field trip and geologic mapping project.

Methods for evaluating student outcomes:

The students will be evaluated by completing and mastering the Essential Knowledge and Skills for Planet Earth as determined by the instructor.

Teacher Qualifications:

The teacher of this course shall be certified in any science or composite science.

Additional information (optional):

Original course creator: Austin Independent School District