SLATE Demonstration Curricula
Contextualizing English and Environmental Science Education
Contextualizing English and Environmental Science Education

Sustainability: The New Job Market

Prepared by
San Bernardino West English and Environmental Science
Contextualized Learning Council
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Contextualizing English and Environmental Science Education

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In 2011, the James Irvine Foundation generously committed to funding two years of SLATE with the following objectives:

1. Establish English and mathematics cross-discipline, intersegmental faculty councils called Contextualized Learning Councils (CLCs) to create teaching materials and methodologies that provide context and links to real-world applications;

2. Develop, publish, and disseminate eight contextualized curricular units, four English and four mathematics, connected to technical education and other academic disciplines; and

3. Develop a model of faculty professional development.

To achieve the objectives, CLCs were established across California in early 2011. In addition to English and mathematics, the disciplines represented were bio-science, business, environmental science, industrial technologies, mechatronics/manufacturing and product design, public health, public safety, social science, and statistics. Each of the councils had its own personality and motivations, and the curriculum reflects that. The contextualized learning councils were:

- Contra Costa English, Mathematics, and Environmental Science
- Los Angeles English and Social Science
- Placer-Nevada English and Public Safety
- Placer-Nevada Mathematics, Engineering, and Manufacturing
- San Bernardino West English and Environmental Science
- San Francisco Mathematics and Public Health
- Santa Barbara English, Journalism, and Media Arts
- Santa Barbara Mathematics and Automotive
- Shasta English and Small Business
- Shasta Mathematics and Industrial Technology
In addition to creating field-test ready curricula through an interdisciplinary and linked approach to improve student learning, SLATE improved professional learning for faculty via the same strategy. The SLATE curriculum design process, involving regional faculty members working across disciplines and segments, proved to be a powerful form of professional development. Participants had the advantage of long-term, ongoing support in a venue where they gained in-depth content knowledge informed by a cross-discipline.

The teaching strategies developed through SLATE will be extremely valuable as SLATE high school faculty prepare students with 21st century skills that meet the rigor and relevance demanded by the Common Core State Standards. At the same time, their postsecondary partners have a better understanding of these new standards: what they mean in terms of high school students’ preparation and what adjustments colleges may need to make regarding aligning curricula, programs, and services to ensure students’ continued progress.

Overall, the game-changing cross-disciplinary curriculum and assessments SLATE participants developed have moved them to the forefront of educational leadership. As evidence grows regarding the link between quality professional development and improved student achievement—and school reform—SLATE stands out as an exemplar of how dialog and reflection in a learning community of colleagues turn into achievement in the classroom.

Sandra Scott, Project Director
**Council Background**

The San Bernardino West Contextualized Learning Council (CLC) was comprised of English and science teachers from middle schools and high schools, as well as representatives from Riverside Community College and California State University, San Bernardino. Districts represented by CLC members included Chino Valley Unified School District, Ontario-Montclair School District, Alta Loma School District, and Etiwanda School District.

Faculty participants included:

- Middle-school teachers of English who provide instruction to underperforming students, benchmark-level students, and honors/gifted and talented students.
- Middle school science teachers who provide instruction to students in 8th grade earth sciences.
- High school teachers of English who provide instruction to classes at benchmark, honors, and advanced placement levels in grades 9–12.
- A high school science teacher whose students are part of an Environmental Science Career Pathway.

The work on the SLATE curriculum provided a forum for stimulating dialogue and sharing of research-based teaching strategies throughout the development process. Several teachers intend to pilot the SLATE units in their classrooms in the future as they move toward implementation of Common Core State Standards.
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INTRODUCTION

Grade Level:
high school

Time:
This unit will take approximately three to six weeks, depending on grade level. The suggested time frame is six weeks for freshmen, three weeks for juniors and seniors.

Cross-Disciplines:
• English
• Environmental Science

Instructional Materials:
See specific lessons.

Required Technology:
See specific lessons.

Assessments:
See specific lessons.

Unit Overview
This unit uses research and English communication skills (written and spoken) to investigate a “green job” and the environmental context from which it emerged, with a direct tie to Advanced Placement (AP) environmental themes. The unit emphasizes the use of
• the Internet for research,
• presentation software, and
• group interaction, collaboration, and negotiation.

This is a summative unit that connects information from previous environmental study coursework on such topics as sustainability or an overview of human impact on the environment (e.g., energy use, resource use, pollution). The goal of this unit is for students to apply English skills meaningfully and correctly in an environmental science context, as well as to connect traditional school course content to real-world careers.
Essential and Topical Questions

Essential Question:
How do new developments or discoveries impact the way we operate and interact in the world?

Post the essential question in a prominent place in the classroom and refer to it frequently. Students will discuss/respond to this question throughout the unit/lessons, as appropriate. Note how answers change, or don’t change, over time, based on experiences and new knowledge and skills. Answering these questions should lead to more questions as students create their own deep knowledge, understandings, and transferable skills.

Topical Question:
What are the new green jobs, and how do they tie to the renewed interest in sustainability?

Learning Objectives
Students will research, analyze, and synthesize data and information to
• report on key environmental areas, including the context for environmental issues and subsequent job opportunities;
• weigh various sides of an environmental issue and make responsible decisions as individuals and as members of their community;
• report both formative and summative information in a variety of formats (e.g., journals, PowerPoint/other presentations, projects) that are attuned to the rhetorical situation and the elements of effective writing and communication; and
• demonstrate the effective use of communication and critical thinking skills (e.g., collaboration, writing, analysis, synthesis, speaking) necessary to successfully complete the various tasks.

Prior Knowledge
• grade level proficiencies in reading and writing
• basic research skills, including the use of the Internet
• a basic understanding of sustainability (i.e., an intersection of environmental, business, and cultural sustainability)
• a basic awareness of various problems in the environment (e.g., global warming, the effects of plastics, landfills), as well as general knowledge of biology and chemistry
Standards

Advanced Placement (AP) Environmental Themes from College Board’s AP Environmental Science Course* (see Handout 1 and Appendix 1)

Key environmental themes for this unit include:

AP 5. Environmental problems have a cultural and social context.
   • Understanding the role of cultural, social, and economic factors is vital to the development of solutions.

AP 6. Human survival depends on developing practices that will achieve sustainable systems.
   • A suitable combination of conservation and development is required.
   • Management of common resources is essential.

National Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects†; Standards for English Language Arts 6–12

College and Career Readiness Anchor Standards for Writing—Text Type and Purposes:

1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

Writing Standards 6–12 (Grades 11–12):

W 4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

W 6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

W 7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

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W 8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard form for citation.

W 10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects (Grades 11–12):

WHST 1. Write arguments focused on discipline-specific content.
Lesson 1
Environmental Theme Exploration

Setup

Time:
Depending on grade level and students’ access to the Internet, this lesson may require 3–5 class periods of 50–55 minutes each.

Instructional Materials:
- credible Internet sites (for research process)
- format for correlating/collating research results, e.g., graphic organizers or foldable notes (see Activity 3)
- Handout 1 (AP Environmental Science Course Themes)
- Appendix 2 (Sample Environmental Research Internet Websites)

Required Technology:
Computer lab with access to the Internet.

Assessment:
Working in groups, students will
- select one of six themes provided by the teacher to research (Activity 1);
- conduct Internet research on their chosen theme, including related green jobs, and identify at least three credible sources to illustrate the elements of their theme (Activity 2); and
- correlate/collate the information using graphic organizers or foldable notes (Activity 3).

Introduction
Pass out Handout 1 and introduce students to the six AP Environmental Science course themes:

1. Science is a process.
   - Science is a method of learning more about the world.
   - Science constantly changes the way we understand the world.

2. Energy conversions underlie all ecological processes.
   - Energy cannot be created; it must come from somewhere.
   - As energy flows through systems, at each step more of it becomes unusable.
3. The Earth itself is one interconnected system.
   • Natural systems change over time and space.
   • Biogeochemical systems vary in ability to recover from disturbances.

   • Humans have had an impact on the environment for millions of years.
   • Technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment.

5. Environmental problems have a cultural and social context.
   • Understanding the role of cultural, social, and economic factors is vital to the development of solutions.

6. Human survival depends on developing practices that will achieve sustainable systems.
   • A suitable combination of conservation and development is required.
   • Management of common resources is essential.

**Activity 1**

Students choose one of the six environmental themes to research. Assist students with choices to ensure all themes are chosen.

Following are two activities designed to prepare students for researching their chosen theme and organizing their research results.

**Activity 2**

Instruct students on evaluating source credibility and source documentation. Many sources already exist on the Internet, including:

- OWL Purdue site: http://owl.english.purdue.edu/owl/resource/553/01/
- Bedford St. Martins site: http://bcs.bedfordstmartins.com/resdoc5e/tips-for-evaluating-sources.htm
- Lakeland Library Research site: http://library.lakelandcc.edu/PDFs/research/evaluationsources.pdf

**Activity 3**

Instruct students on methods to correlate/collate gathered information. Use preferred method or consider one of the following:

- graphic organizers, e.g., Venn Diagrams, bubble maps, tree maps, cause and effect
- foldable notes, e.g., folded books, large Q & A book, large vocabulary book, large matchbook, bound books, layered look book, top tab books, paper file folders (*ideas taken from Big Book of Books and Activities by Dinah Zike, M.Ed.*)

Using the knowledge and skills they have gained from Activities 1–3, students research their chosen environmental theme and identify at least three credible Internet sources that illustrate the elements of the theme. Students should begin now to research related green jobs for their chosen theme. They will refer to green jobs throughout the lessons and will be asked to complete a green jobs project in Lesson 4. See Green Jobs Project, Lesson 4, Activity 2a, for online resources students can use.

For sample research sites, see Appendix 2: Sample Environmental Research Internet Websites.

Close

The Internet sources demonstrated above then become the basis for small group discussions about each environmental theme in theme-alike groups.
LESSON 2
Environmental Theme Exploration and Reporting

Setup

Time:
Approximately three to five 50- to 55-minute class periods. Time for this lesson will vary depending on the types of projects students select, availability of materials, and whether student groups will be able to work outside class.

Instructional Materials:

• examples of collages, conceptual art, and mobiles
• materials for collages, conceptual art, and/or mobiles; materials will vary according to the medium, e.g.:
  ▪ collages: pictures from magazines, photos, three-dimensional objects, scissors, poster board, and glue
  ▪ conceptual art: clay, markers, colored pencils, pastels, paints, brushes
  ▪ mobiles: “found” objects, wire, wood, heavy paper, scissors

Encourage students to use found or recycled objects where possible. If students will be providing some or all of their own materials, set a limit on the amount that the group can spend to purchase materials so that some groups are not at a disadvantage. Setting a very low limit (e.g., $0 to $5.00) will also encourage students to be resourceful and reuse and recycle.

Required Technology:
N/A

Assessment:
A completed project that visually represents the synthesis of the groups’ research on their chosen environmental theme.
**Introduction**

Instead of writing a report, students will use art to convey what they have learned as they continue to research their chosen environmental theme. Assist students in forming groups of two to three individuals with similar interest in an environmental issue. Tell students that the purpose of the assignment is to synthesize what they have learned about their chosen environmental theme.

Instruct students on three possible methods to present gathered information:

- collages
- conceptual art
- mobiles

Provide examples for each of the options so that students understand what is involved. Encourage them to be creative and original.

**Activity**

Students synthesize the group’s information on their chosen environmental theme using one of the media listed in the introduction: collages, conceptual art, or mobiles.

**Close**

Facilitate the sharing of each group’s project, either through a gallery tour or brief presentation.
LESSON 3
Environmental Hero Creation

Setup
Time:
Activity 1a may require three to four class periods of 50–55 minutes each, including one class period for the introduction. Optional Activity 1b may require an additional three class periods, or students may complete this option outside of class.

Instructional Materials:

- teacher-generated examples of heroes, including a modern hero
- credible Internet sites (for research processes, environmental information, hero’s journey, and green jobs)
- materials for hero creation and comic strips/storyboards (e.g., paper, markers, crayons, colored pencils)
- Handout 3 (Environmental Action Hero Storyboard)

Required Technology:
- access to computer lab with Internet

Assessment:
- Students design an environmental hero and villain.
- Students create a storyboard and comic strip.

Introduction
In this lesson, students will create an environmental hero based on the concept of the hero’s journey in literature. This storytelling pattern uses these key elements: departure, initiation, and return.

Provide students with a few examples from various mythologies, for example, the Greek Heracles or a folk hero such as Robin Hood. In addition, include an example of a modern hero, such as Spiderman. Ensure that examples reflect diverse cultures and ask students to share examples from their own culture. In each case, select a myth that includes the key elements of departure, initiation, and return.

Begin this lesson by asking students who their heroes are and why. What makes a hero? List their responses on the board and look for common themes, especially those that have to do with taking a stand, doing the “right thing” even if it is not easy, fighting for those who can’t fight for themselves, and trying to make the world a better place. Let students know that most cultures have heroes and that they share common traits and undertake similar superhuman exploits.
Share the template that has been created or selected in order to create the hero and/or refer to one of the websites below. Based on the selection of hero’s journey templates and websites, tell students that they will have the opportunity to create their own environmental action hero, a man or woman with exceptional powers that they use to protect the environment.

Choose which hero’s journey templates and websites to use. Many resources already exist on the hero’s journey, including many English textbooks and the following websites:

- International Reading Association’s Read Write Think site: http://www.readwritethink.org/classroom-resources/student-interactives/hero-journey-30069.html
- Maricopa Community College site: http://www.mcli.dist.maricopa.edu/smc/journey/ref/summary.html
- The Hero’s Journey Foundation: http://www.heroesjourneyfoundation.org/

For more online options, use the search term “hero’s journey.”

**Activity 1a**

The parameters of the assignment and assessment standards are included in Handout 3.

1. In small groups (based on group selection of an environmental theme), students create an environmental action hero. Environmental heroes should include the following:
   - a name connected to the chosen environmental theme;
   - archetypal or symbolic elements connected to environmental information; and
   - environmentally related accouterments (e.g., weapons, vehicles).

2. Using the assigned template, students can create and draw their action hero and label all the symbolic elements and their connection(s) to their environmental research. Students can also create a three-dimensional version of their hero using a doll or other figure.

3. Students create (1) a written plot line (i.e., exposition, rising action, climax, falling actions, resolution), and (2) a storyboard for one episode in a potential comic strip series that focuses on the birth of the hero. They must tie in environmental facts with documentation that created the need for such a hero. As part of the storyboard, students create an environmental villain who must be a personification of environmental issues. The target audience is a class at a local elementary school.
Activity 1b (Optional)

Direct students to use the storyboard and single episode created in Lesson 3, Activity 1a, to develop additional episodes for their comic strip. Student comic strip episodes should continue to highlight the environmental issues in the group’s area of emphasis and incorporate research conducted earlier in the unit. Students can include characters that represent the environmental jobs researched earlier in this unit, if they wish. (Also see Lesson 4, Activity 2, Green Jobs Project.) Students should continue to keep the target audience in mind (class at a local elementary school). The assignment standards for Activity 1a (found in Handout 3) can also be used for this optional exercise.

Close

Facilitate the sharing and explanation of each group’s environmental hero comic strip with the class and possibly with a class at a neighboring elementary school.
LESSON 4
Summative Assessments

Setup

Time:
Group Activity 1 (PowerPoint Presentation) may take up to five class periods of 50–55 minutes each, including presentation time. Group Activities 2a (Green Jobs Project) and 2b (Green Jobs Résumé) may require two to three class periods each. Activity 3 (Reflective Paper) may require up to one class period to introduce the assignment and review standards.

Instructional Materials:
- Handouts 4A (PowerPoint Presentation), 4B (Green Jobs Report), 4C (Green Jobs Résumé), and 4D (Reflective Essay)
- Appendix 3 (Topics for Summative Assessment)

Required Technology:
- access to computer lab
- PowerPoint software

Assessment:
All students will complete three summative assessments (Activities 1–3). Two assessments will be group projects (Activities 1 and 2). Select topics for students to use in their group projects from the list of possible topics below (the list has also been included as Appendix 3). These topics provide real-world contexts for the six AP Environmental Science themes that have been studied in the previous lessons. The third assessment (Activity 3) will consist of an individual, reflective paper.

Guidelines, including sample evaluation criteria, are included below for each assessment. Select topics for a summative assessment (Appendix 3).

Potential topics include the following:
1. Renewable/alternative energy: Is it a realistic, feasible alternative?
2. Ozone depletion: causes, changes, future.
5. The San Onofre power plant’s history and its future.
6. Invasive species in Southern California: Problem plants and animals in California habitats. What are they? Where did they come from? Why are they here? What are some environmental/ecological solutions to this problem and their associated costs?
7. California fisheries regulations, laws, and the ecological reasoning behind them.

8. Recycling? Does it really help? How so? What still needs to be done? How does recycling use in the United States compare with that of other nations?

9. Municipal water treatment facility for Ontario/Chino: How do urban centers handle water treatment? How does it work? What are some progressive approaches to this age-old problem?

10. Land preservation acts, green space, and open space: Their value and costs. What are some successful plans that have already been implemented?

11. Compare and contrast the major environmental organizations (National Audubon Society, Sierra Club, Defenders of Wildlife, Greenpeace, The Nature Conservancy, The National Wildlife Federation, Earth First!, etc.). What are their goals? How do they differ? What actions have they taken to try to accomplish their goals? Have they been successful? How do you measure success?

12. Organic vs. traditional farming methods: Which method is more productive, and which is more environmentally benign?

13. In the western United States, water quality and supply is a serious concern. Discuss this issue from the perspective of farmers, ranchers, developers, and environmentalists.

14. Evaluate the local city plans for a recycling program for paper, aluminum, plastic, and glass. What are its strong and weak points? How could it be made more efficient?

15. Scrap yards: What can they recycle, and what can’t they recycle? What do they pay for recycled materials? Why does the market fluctuate so much? How much do they make in this business?

16. Cogeneration: Cities that burn their garbage for heat and electricity. (Examples include Harrisburg, PA; Columbus, OH; Long Beach, CA; and Akron, OH.)

17. There is a lot of land, so why are we running out of landfills? What makes it hard to find acceptable sites for them? How safe are landfills?


19. Some parts of Antarctica are badly polluted. How? Why? Who owns Antarctica? How does tourism impact the environment in Antarctica? What are the costs?

20. Supertankers and oil spills: Their ecological aftermath. How well did Alaska survive the Exxon Valdez tragedy? Have there been larger or more destructive spills?

21. The BP gulf oil disaster: How has the environment been affected? Are things truly “cleaned up”?

22. A conflict of interest: Fishermen vs. oil drilling on America’s most fertile fishing grounds.

23. Acid rain: California as both a source and recipient.

24. The health effects of indoor air pollution: How does home or business insulation expose us to toxic chemicals?

25. Mercury (or lead or cadmium) in the environment: Where does it come from and how does it affect us?
26. Carcinogens in the environment: How do we test for them, and are they worth the time to worry about and deal with them?

27. Are you a travel and tourism enthusiast? Write on ecotourism—nature tours, African safaris, swimming with dolphins, etc. Are these experiences beneficial to host countries and to the animals? Are there unintended consequences?

28. Chemical pesticides: An agricultural blessing or an ecological disaster? Why don’t we make greater use of biological pesticides, such as insect pheromones?

29. City planning: How can you build an environmentally sound, beautiful, energy-efficient, recycling urban society?

30. Mass transit is a way to save energy and reduce pollution. Why do so few cities use it?

31. America’s love affair with the car: How it affects our energy and resource supply and the environment. How would things change if the rest of the world had as many cars per person on average as Americans do?

32. Design an energy-efficient home (i.e., create a very specific blueprint).

33. The debt crisis and the Third World: How does the interest burden from huge loans prevent developing countries from pursuing ecologically smart strategies? What role does the World Bank play in international conservation?

34. Why forest fires aren’t always bad.

35. Must business and environmental protection always be at odds? Can environmentalism be good business?

**Introduction to the Group Activities 1 & 2**

Review the selected topics and guidelines for the group projects with students, who form groups to work on the topic of most interest to them and prepare for the two group projects. In their groups, students

- compile environmental information relevant to their chosen topic, including related green jobs;
- determine what is necessary to prepare for the upcoming assessments; and
- decide how the work will be distributed among the group members.

**Activity 1—PowerPoint Presentation (Group Project)**

The purpose of the PowerPoint presentation is to address one of the assigned topics by taking a position (e.g., good business practices and environmental protection are compatible) using the results of their research and supporting their statements with evidence. The parameters of the assignment and assessment standards are included in Handout 4A.
Assignment Standards: PowerPoint Presentation
The PowerPoint presentation should address/include/demonstrate the following:

Audience:
Presenters have analyzed the audience and presentation environment and designed the presentation to use appropriate language, images, etc. Teachers may arrange for students to present to a specific audience, for example an elementary school class, and should assist students in determining what considerations they need to make to ensure the presentation is appropriate for that audience.

Environment Position/Stance:
The presentation includes a clear and concise statement of the group’s position/stance on their environmental topic.

Organization:
The presentation is a maximum of 20 minutes long and includes approximately 20 slides, as follows:

- a title slide;
- a slide that clearly and concisely states the position/stance on an environmental issue;
- additional slides that provide:
  - context for the selected environmental issue;
  - relevant environmental themes;
  - the issue’s impact on society, including the three areas of sustainability:
    - environment
    - culture
    - economics
  - use of images, quotes, and citations from credible sources (see evidence) that are correctly referenced in the final, works-cited slide; and
- a closing slide that includes:
  - reflections on the selected environmental theme;
  - the extent to which the environmental theme can make a difference in the region; and
  - a properly constructed works-cited slide following the teacher’s preferred style guide.
Evidence:
The presentation includes at least four credible sources of data and/or information that support the position/stance. In addition, students should use a variety of relevant images, including at least one of each of the following: geographic map, diagram, photograph, concept map. Images may be students’ original work or taken from a source (and properly cited).

Analysis:
The presentation demonstrates the ability to understand and break down informational materials into their component parts and explore the different aspects or elements of a particular idea or concept.

Works Cited:
Following the preferred style guide, a correctly formatted works-cited slide, including citations for images, is included.

PowerPoint:
Students effectively use visuals, text, and transitions in PowerPoint, including the four required images under Evidence.

Activity 2—Green Jobs Project
There are two components to this assignment:
1. a three- to five-page formal written green jobs report that answers the question, “How does your selected environmental issue/topic create a need for your researched green job?”
2. a sample résumé for a person who would be well-qualified to perform that green job

2a. Green Jobs Report
The purpose of the green jobs report is to answer the question, “How does the selected environmental topic create a need for the green job you identified in your research?” In their groups from Activity 1, students research the education and experience needed for one of the green jobs connected to their group’s environmental topic. The parameters of the assignment and assessment standards are included in Handout 4B.

Research information sites for current green jobs to assist students in research. Possible resources include:
- The Green Job Bank: http://www.thegreenjobbank.com/
- Sierra Club: http://www.sierraclub.org/greenjobs/jobs/default.aspx
Assignment Standards: Green Jobs Report

The green jobs report should address/demonstrate/include:

Organization:
The three- to five-page paper contains an introduction, supporting details, and a conclusion. Ideas are clearly stated and logically connected. The main points of the paper are easy to follow.

Content:
The report should include

- a job description;
- a brief history of how this job came about;
- an explanation as to what makes the job “green,” e.g., how it is environmentally conscious or how it reduces the carbon footprint on Earth;
- the job requirements, such as
  - education, i.e., required degree(s) and best programs/schools;
  - training, e.g., what kind and how much of on-the-job or apprentice training is necessary;
- employment information, such as
  - current labor market demand and future potential for this job;
  - type of employers, i.e., public and/or private;
  - typical salary range;
  - location, i.e., local, national, or international;
- related careers; and
- a conclusion that summarizes how this green job will impact sustainability (environment, culture, and economics).

Evidence:
There is sufficient, credible data and information from outside sources to support the report.

Works-Cited Page:
Following the style guide specified by the teacher, the paper includes a correctly formatted works-cited page.

Mechanics and Grammar:
The paper should have few or no errors in grammar, punctuation, and spelling.
2b. Green Jobs Résumé

For this portion of the assignment, groups create a sample résumé for someone they would consider to be well-qualified for their green job. The teacher may wish to provide a template for the résumé that includes basic elements such as name, contact information, professional goal, education and training, and experience. Microsoft Word has a number of résumé templates available in the program or online. The parameters of the assignment and assessment standards are included in Handout 4C.

Emphasize to students the importance of a concise résumé that has no spelling or grammatical errors. The following information can serve as guidelines for a well-written/presented résumé.

**Assignment Standards: Résumé**

The content should include

- name and contact information;
- employment objective statement (the statement conveys employment goals and is specific about the position and type of employment desired);
- skills and abilities (skills are clearly defined);
- employment history;
- education (formal education and other professional preparation are presented);
- additional attributes (awards, certificates, etc., relevant to the position are included); and
- affirming action words such as: managed, evaluated, supervised, established, researched, designed, developed (see [http://jobsearch.about.com/od/resumes/a/actionverb.htm](http://jobsearch.about.com/od/resumes/a/actionverb.htm) for other examples).

The résumé should have

- balanced margins;
- appropriate font, style, size;
- logical order of organization; and
- no spelling, grammar, or punctuation errors.

**Close**

Help students understand and explain the correlation and connections between their chosen environmental theme, the environmental issue they addressed, the topic material they researched, and the green jobs they investigated.

**Extending the Lesson**

Students can visit a green job business like the one they researched or complete a green job internship.
Activity 3—Reflective Paper (Individual Essay)

This summary assessment is intended to be a public reflection on the impact the environmental studies unit has had on the student. Students develop a reflective and informative report summarizing their experiences in this unit by answering the following question: What impact have your environmental studies had on you? Students individually write a two- to three-page reflective paper that they may present to their group or to the class. The parameters of the assignment and assessment standards are included in Handout 4D.

The student’s essay should address/answer the following and demonstrate sufficient grade-level mastery of organizational principles and writing conventions.

1. The environmental theme/issue they chose and why. To help guide their writing, students might consider completing the following sentence frame as a start: “Of all the issues I’ve learned about sustainability and the green job market, the issue that has made the most impact on me is [issue] because ....”

2. What they learned about their issue in respect to sustainability (environment, culture, and economics) on a global scale and in their region. Students should give a specific example of this issue in their community.

3. Given what they have learned in this lesson, how has their thinking changed and how will they behave differently as a result? What specific changes will they make in their lives, and what specifically will they do to advance this theme in their community?

Assignment Standards: Reflective Paper

- The essay addresses all three items listed above.
- The language is accurate, clear, and appropriate for the purpose.
- The essay is organized in a logical sequence.
- The student’s analysis describes the learning experience and how it contributed to the understanding of self, others, and/or the community.
- Grammar and spelling are error-free.
LESSON 1 Handouts

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LESSON 2: No Handouts

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3: Environmental Action Hero Storyboard ........................................................................ 33

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4B: Green Jobs Report......................................................................................................... 36
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4D: Reflective Essay .......................................................................................................... 39
Contextualizing English and Environmental Science Education

AP ENVIRONMENTAL SCIENCE COURSE THEMES*

Lesson 1, Introduction

1. Science is a process.
   - Science is a method of learning more about the world.
   - Science constantly changes the way we understand the world.

2. Energy conversions underlie all ecological processes.
   - Energy cannot be created; it must come from somewhere.
   - As energy flows through systems, at each step more of it becomes unusable.

3. The Earth itself is one interconnected system.
   - Natural systems change over time and space.
   - Biogeochemical systems vary in ability to recover from disturbances.

   - Humans have had an impact on the environment for millions of years.
   - Technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment.

5. Environmental problems have a cultural and social context.
   - Understanding the role of cultural, social, and economic factors is vital to the development of solutions.

6. Human survival depends on developing practices that will achieve sustainable systems.
   - A suitable combination of conservation and development is required.
   - Management of common resources is essential.

ENVIRONMENTAL ACTION HERO STORYBOARD

Lesson 3, Activity 1a (and optional Activity 1b)

1. In small groups (based on group selection of an environmental theme), create an environmental action hero. Environmental heroes should include the following:
   - a name connected to the chosen environmental theme;
   - archetypal or symbolic elements connected to environmental information; and
   - environmentally related accoutrements (e.g., weapons, vehicles).

2. Using the assigned template, create and draw your action hero and label all the symbolic elements and their connection(s) to their environmental research. You may also create a three-dimensional version of your hero using a doll or other figure.

3. Create (1) a written plot line (i.e., exposition, rising action, climax, falling actions, resolution), and (2) a storyboard for one episode in a potential comic strip series that focuses on the birth of the hero. You must tie in environmental facts with documentation that created the need for such a hero. As part of the storyboard, create an environmental villain who must be a personification of environmental issues. The target audience is a class at a local elementary school.

Assignment Standards

- An original environmental hero has been created and includes the following:
  - a name connected to the chosen environmental theme;
  - archetypal or symbolic elements connected to environmental information; and
  - environmentally related accoutrements (e.g., weapons, vehicles).
- There is an environmental villain who personifies environmental issues.
- The plot line includes exposition, rising action, climax, falling actions, and a resolution.
- A storyboard is provided for one episode that integrates facts/documentation to support the need for the hero (additional episodes if optional Activity 3b is assigned).
- The comic strip content and images are appropriate for an elementary school audience.
POWERPOINT PRESENTATION

Lesson 4, Activity 1

The purpose of the PowerPoint presentation is to address one of the assigned topics by taking a position (e.g., good business practices and environmental protection are compatible) using the results of your research and supporting your statements with evidence.

Assignment Standards

The PowerPoint presentation should address/include/demonstrate the following:

Audience:
As presenters, your group has analyzed the audience and presentation environment specified by your teacher and designed the presentation to use appropriate language, images, etc.

Environment Position/Stance:
Your presentation includes a clear and concise statement of your group’s position/stance on your environmental topic.

Organization:
Your presentation is a maximum of 20 minutes long and includes approximately 20 slides, as follows:

• a title slide;
• a slide that clearly and concisely states the position/stance on an environmental issue;
• additional slides that provide:
  ▪ context for the selected environmental issue;
  ▪ relevant environmental themes;
  ▪ the issue’s impact on society, including the three areas of sustainability:
    ▪ environment
    ▪ culture
    ▪ economics
• use of images, quotes, and citations from credible sources (see “Evidence” on next page); and
• a closing slide that includes
  ▪ reflections on the selected environmental theme;
  ▪ the extent to which the environmental theme can make a difference in the region; and
  ▪ a properly constructed works-cited slide following your teacher’s preferred style guide.

Evidence:
Include at least four credible sources of data and/or information that support your position/stance. In addition, use a variety of relevant images, including at least one of each of the following: geographic map, diagram, photograph, concept map. Images may be your original work or taken from a source (and properly cited).

Analysis:
Demonstrate your ability to understand and break down informational materials into their component parts and explore the different aspects or elements of a particular idea or concept.

Works Cited:
Following the style guide indicated by your teacher, include a correctly formatted works-cited slide, including citations for images.

PowerPoint:
Use visuals, text, and transitions effectively, including the four required images identified in Evidence above.

2013, www.iebcnow.org
GREEN JOBS REPORT

Lesson 4, Activity 2a

The purpose of the green jobs report is to answer the question, "How does the selected environmental topic create a need for the green job you identified in your research?" In your group from Activity 1, research the education and experience needed for one of the green jobs connected to your group’s environmental topic.

Possible resources include:

- The Green Job Bank: http://www.thegreenjobbank.com/
- Sierra Club: http://www.sierraclub.org/greenjobs/jobs/default.aspx

Assignment Standards

The green jobs report should address/demonstrate/include the following:

Organization:

The three- to five-page paper contains an introduction, supporting details, and a conclusion. Ideas are clearly stated and logically connected. The main points of the paper are easy to follow.

Content:

The report should include

- a job description;
- a brief history of how this job came about;
- an explanation as to what makes the job “green,” e.g.: How is it environmentally conscious? How does it reduce the carbon footprint on Earth?
- the job requirements, such as
  - education, i.e., required degree(s) and best programs/schools;
  - training, e.g., what kind and how much of on-the-job or apprentice training is necessary;
• employment information, such as
  ▪ current labor market demand and future potential for this job;
  ▪ type of employers, i.e., public and/or private;
  ▪ typical salary range;
  ▪ location, i.e., local, national, or international;
• related careers; and
• a conclusion that summarizes how this green job will impact sustainability (environment, culture, and economics).

Evidence:
Use sufficient, credible data and information from outside sources to support the report.

Works-Cited Page:
Following the style guide specified by the teacher, include a correctly formatted works-cited page.

Mechanics and Grammar:
Make certain your paper has no errors in grammar, punctuation, and spelling.
RÉSUMÉ

Lesson 4, Activity 2b

In your group, create a sample résumé for someone the group would consider to be well-qualified for their green job. Microsoft Word has a number of résumé templates available in the program or online, or use the template assigned by your teacher. The following information can serve as guidelines for a well-written/presented résumé.

Assignment Standards

The content should include

- name and contact information;
- objective statement (the statement conveys employment goals and is specific about the position and type of employment desired);
- skills and abilities (skills are clearly defined);
- employment history;
- education (formal education and other professional preparation are presented);
- additional attributes (awards, certifications, etc., relevant to the desired position are included); and
- affirming action words such as: managed, evaluated, supervised, established, researched, designed, developed (see http://jobsearch.about.com/od/resumes/a/actionverb.htm for additional examples).

The résumé should have

- balanced margins;
- appropriate font, style, size;
- logical order of organization; and
- no spelling, grammar, or punctuation errors.
Reflective Essay

Lesson 4, Activity 3

Develop a reflective and informative report summarizing your experiences in this unit by answering the following question: What impact have your environmental studies had on you? Write a two- to three-page reflective paper. Your essay should address/answer the following and demonstrate sufficient mastery of organizational principles and writing conventions:

1. Which environmental theme/issue did you choose and why did you choose it? To help guide your writing, consider completing the following sentence frame as a start: “Of all the issues I’ve learned about sustainability and the green job market, the issue that has made the most impact on me is [issue] because ....”

2. What did you learn about your issue in respect to sustainability (environment, culture, and economics) on a global scale and in your region? Give a specific example of this issue in your community.

3. Given what you have learned in this lesson, how has your thinking changed and how will you behave differently as a result? What specific changes will you make in your life, and what specifically will you do to advance this theme in your community?

Assignment Standards

- The essay addresses all three items listed above.
- The language is accurate, clear, and appropriate for the purpose.
- The essay is organized in a logical sequence.
- Your analysis describes the learning experience and how it contributed to the understanding of self, others, and/or the community.
- Grammar and spelling are error-free.
Appendices

APPENDIX 1: Environmental Science Themes and Related Standards .................................................. 42
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Contextualizing English and Environmental Science Education

ENVIROMENTAL SCIENCE THEMES AND RELATED STANDARDS

Standards and Expected Course Outcomes

This appendix cross-references the California State Science Standards with the six environmental science themes that provide a foundation for the structure of the College Board’s Advanced Placement (AP) Environmental Science course. The AP Environmental Science course is designed to be the equivalent of a one-semester, introductory college course in environmental science that is multidisciplinary in nature, i.e., offered from a wide variety of departments, including geology, biology, environmental studies, environmental science, chemistry, and geography.

The goal of the AP Environmental Science course is to provide students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world, to identify and analyze environmental problems both natural and human-made, to evaluate the relative risks associated with these problems, and to examine alternative solutions for resolving and/or preventing them. https://apstudent.collegeboard.org/apcourse/ap-environmental-science/course-details
<table>
<thead>
<tr>
<th>California State Science Standards ♦</th>
<th>Science is a process.</th>
<th>Energy conservations underlie all ecological processes.</th>
<th>Earth itself is one interconnected system.</th>
<th>Humans alter natural systems.</th>
<th>Environmental problems have a cultural and social context.</th>
<th>Human survival depends on developing practices that will achieve sustainable systems.</th>
<th>Environmental Science Themes ♦</th>
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<tr>
<td>Biology</td>
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<td>A. Earth science concepts</td>
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<td>#6 Ecology – Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:</td>
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<td>B. The atmosphere</td>
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<td>a. Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.</td>
<td></td>
<td>♦</td>
<td>♦</td>
<td>♦</td>
<td></td>
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<td>C. Global water resources and use</td>
</tr>
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<td>b. Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.</td>
<td>♦</td>
<td></td>
<td>♦</td>
<td>♦</td>
<td>♦</td>
<td></td>
<td>I. Earth Systems and Resources</td>
</tr>
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<td>c. Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.</td>
<td>♦</td>
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<td>☼</td>
<td>♣</td>
<td>♣</td>
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<td>D. Soil and soil dynamics</td>
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<td>d. Students know how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.</td>
<td>♦</td>
<td>♣</td>
<td>♣</td>
<td>♣</td>
<td>♣</td>
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<td>A. Ecosystem structure</td>
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<td>e. Students know a vital part of an ecosystem is the stability of its producers and decomposers.</td>
<td>♦</td>
<td>♣</td>
<td>♣</td>
<td>♣</td>
<td>♣</td>
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<td>B. Energy flow</td>
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<td>f. Students know at each link in a food web some energy is stored in newly made structures, but much energy is dissipated into the environment as heat. The dissipation may be represented in an energy pyramid.</td>
<td>♦</td>
<td>♣</td>
<td>♣</td>
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<td>C. Ecosystem diversity</td>
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<td>g. Students know how to distinguish between the accommodation of an individual organism to its environment and the gradual adaptation of a lineage of organisms through genetic change.</td>
<td>♦</td>
<td>♣</td>
<td>♣</td>
<td>♣</td>
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<td>D. Natural ecosystem change</td>
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<td>California State Science Standards</td>
<td>Environmental Science Themes&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Human survival depends on developing practices that will achieve sustainable systems.</td>
<td>Environmental Science Themes Subtopics&lt;sup&gt;2&lt;/sup&gt;</td>
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<td><strong>#7 Evolution</strong> – The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept:</td>
<td>a. Students know why natural selection acts on the phenotype rather than the genotype of an organism.</td>
<td>E. Natural biogeochemical cycles</td>
<td>II. The Living World (cont.)</td>
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<td>b. Students know why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.</td>
<td>A. Population biology concepts</td>
<td>III. Population</td>
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<td>c. Students know new mutations are constantly being generated in a gene pool.</td>
<td>B. Human population</td>
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<td>d. Students know variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.</td>
<td>A. Agriculture</td>
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<td><strong>#8 Evolution</strong> is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:</td>
<td>a. Students know how natural selection determines the differential survival of groups of organisms.</td>
<td>B. Forestry</td>
<td>IV. Land and Water Use</td>
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<td>b. Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment.</td>
<td>C. Rangelands</td>
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<td>c. Students know the effects of genetic drift on the diversity of organisms in a population.</td>
<td>D. Other land use</td>
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<td>California State Science Standards</td>
<td>Environmental Science Themes</td>
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<td>Science is a process.</td>
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<td>Earth itself is one</td>
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<td>Humans problems have a cultural</td>
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<td>and social context.</td>
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<tr>
<th>#8 Evolution (cont.)</th>
<th>Environmental Science Themes</th>
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<tr>
<td>d. Students know reproductive or geographic isolation affects speciation.</td>
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<tr>
<th>Chemistry</th>
<th>Environmental Science Themes</th>
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<tr>
<td></td>
<td>A Energy concepts</td>
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<td>B. Energy consumption</td>
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<td>C. Energy conservation</td>
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<td>D. Nuclear energy</td>
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<td>E. Hydroelectric energy</td>
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<td>F. Energy conservation</td>
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<td>G. Renewable energy</td>
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</tbody>
</table>

### California State Science Standards

#### #8 Evolution (cont.)

d. Students know reproductive or geographic isolation affects speciation.

#### Chemistry

**#3 Conservation of Matter and Stoichiometry**—The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants. As a basis for understanding this concept:

<table>
<thead>
<tr>
<th>a. Students know how to describe temperature and heat flow in terms of the motion of molecules (or atoms).</th>
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</thead>
<tbody>
<tr>
<td>b. Students know chemical processes can either release (exothermic) or absorb (endothermic) thermal energy.</td>
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<tr>
<td>c. Students know energy is released when a material condenses or freezes and is absorbed when a material evaporates or melts.</td>
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<tr>
<td>d. Students know how to solve problems involving heat flow and temperature changes, using known values of specific heat and latent heat of phase change.</td>
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</table>

### Environmental Science Themes

1. Human survival depends on developing practices that will achieve sustainable systems.
<table>
<thead>
<tr>
<th>California State Science Standards</th>
<th>Environmental Science Themes1</th>
<th>Human survival depends on developing practices that will achieve sustainable systems</th>
<th>Environmental Science Themes Subtopics</th>
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<tbody>
<tr>
<td><strong>Physics</strong></td>
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<tr>
<td><strong>#3 Heat and Thermodynamics</strong></td>
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<tr>
<td>Energy cannot be created or destroyed, although in many processes, energy is transferred to the environment as heat. As a basis for understanding this concept:</td>
<td>a. Students know heat flow and work are two forms of energy transfer between systems.</td>
<td>✶ ✷ ✶ ✷ ✶ ✷ ✷ ✷</td>
<td>A Pollution types</td>
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<tr>
<td><strong>Earth Science</strong></td>
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<tr>
<td><strong>#4 Energy in the Earth System</strong></td>
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<tr>
<td>Energy cannot be created or destroyed, although in many processes, energy is transferred to the environment as heat. As a basis for understanding this concept:</td>
<td>a. Students know the relative amount of incoming solar energy compared with Earth’s internal energy and the energy used by society.</td>
<td>✶ ✷ ✷ ✷ ✷ ✷ ✷ ✷</td>
<td>A. Stratospheric ozone</td>
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<td></td>
<td>b. Students know the fate of incoming solar radiation in terms of reflection, absorption, and photosynthesis.</td>
<td>✶ ✷ ✷ ✷ ✷ ✷ ✷ ✷</td>
<td>B. Global warming</td>
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<td></td>
<td>c. Students know the different atmospheric gases that absorb the Earth’s thermal radiation and the mechanism and significance of the greenhouse effect.</td>
<td>✶ ✷ ✷ ✷ ✷ ✷ ✷ ✷</td>
<td>C. Loss of biodiversity</td>
</tr>
<tr>
<td></td>
<td>d. Students know the differing greenhouse conditions on Earth, Mars, and Venus; the origins of those condition; and the climatic consequences of each.</td>
<td>✶ ✷ ✷ ✷ ✷ ✷ ✷ ✷</td>
<td></td>
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<tr>
<td>California State Science Standards ♦</td>
<td>Environmental Science Themes¹</td>
<td>Human survival depends on developing practices that will achieve sustainable systems.</td>
<td>Environmental Science Themes Subtopics #§</td>
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<td><strong>Earth Science (cont.)</strong></td>
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**#5 Energy in the Earth System**—Heating of Earth’s surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and oceans, producing winds and ocean currents. As a basis for understanding this concept:

- **a. Students know how differential heating of Earth results in circulation patterns in the atmosphere and oceans that globally distribute the heat.**
- **b. Students know the relationship between the rotation of Earth and the circular motions of ocean currents and air in pressure centers.**
- **c. Students know the origin and effects of temperature inversions.**
- **d. Students know properties of ocean water, such as temperature and salinity, can be used to explain the layered structure of the oceans, the generation of horizontal and vertical ocean currents, and the geographic distribution of marine organisms.**
- **e. Students know rain forests and deserts on Earth are distributed in bands at specific latitudes.**
- **f. Students know the interaction of wind patterns, ocean currents, and mountain ranges results in the global pattern of latitudinal bands of rain forests and deserts.**
- **g. Students know features of the ENSO (El Nino southern oscillation) cycle in terms of sea-surface and air temperature variations across the Pacific and some climatic results of this cycle.**

*Science is a process. Energy conservations underlie all ecological processes. Earth itself is one interconnected system. Humans alter natural systems. Environmental problems have a cultural and social context. Human survival depends on developing practices that will achieve sustainable systems.*
### California State Science Standards

<table>
<thead>
<tr>
<th>Earth Science (cont.)</th>
<th>Environmental Science Themes 1</th>
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</table>

#### #6 Energy in the Earth System
- Climate is the long-term average of a region’s weather and depends on many factors. As a basis for understanding this concept:

| a. Students know weather (in the short run) and climate (in the long run) involve the transfer of energy into and out of the atmosphere. | ☀ ☀ ☀ ☀ ☀ ☀ ☀ |
| b. Students know the effects on climate of latitude, elevation, topography, and proximity to large bodies of water and cold or warm ocean currents. | ☀ ☀ ☀ ☀ ☀ ☀ |
| c. Students know how Earth’s climate has changed over time, corresponding to changes in Earth’s geography, atmospheric composition, and other factors, such as solar radiation and plate movement. | ☀ ☀ ☀ ☀ ☀ |
| d. Students know how computer models are used to predict the effects of the increase in greenhouse gases on climate for the planet as a whole and for specific regions. | ☀ ☀ ☀ ☀ ☀ |

#### #7 Biogeochemical Cycles
- Each element on Earth moves among reservoirs, which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles. As a basis for understanding this concept:

| a. Students know the carbon cycle of photosynthesis and respiration and the nitrogen cycle. | ☀ ☀ ☀ ☀ |
| b. Students know the global carbon cycle: the different physical and chemical forms of carbon in the atmosphere, oceans, biomass, fossil fuels, and the movement of carbon among these reservoirs. | ☀ ☀ ☀ ☀ |

1. Human survival depends on developing practices that will achieve sustainable systems.
<table>
<thead>
<tr>
<th>California State Science Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Science is a process.</strong></td>
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<td>Energy conservations underlie all ecological processes.</td>
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<tr>
<td>Earth itself is one interconnected system.</td>
</tr>
<tr>
<td>Humans alter natural systems.</td>
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### Environmental Science Themes

<table>
<thead>
<tr>
<th>Environmental Science Themes Subtopics</th>
</tr>
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<tbody>
<tr>
<td><strong>Earth Science (cont.)</strong></td>
</tr>
<tr>
<td><strong>#7 Biogeochemical Cycles</strong>–Each element on Earth moves among reservoirs, which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles. As a basis for understanding this concept (cont.):</td>
</tr>
<tr>
<td>c. Students know the movement of matter among reservoirs is driven by the Earth's internal and external sources of energy.</td>
</tr>
<tr>
<td>d. Students know the relative residence times and flow characteristics of carbon in and out of its different reservoirs.</td>
</tr>
</tbody>
</table>

<p>| a. Students know the thermal structure and chemical composition of the atmosphere. |
| b. Students know how the composition of Earth's atmosphere has evolved over geologic time and know the effect of outgassing, the variations of carbon dioxide concentration, and the origin of atmospheric oxygen. |
| c. Students know the location of the ozone layer in the upper atmosphere, its role in absorbing ultraviolet radiation, and the way in which this layer varies both naturally and in response to human activities. |</p>
<table>
<thead>
<tr>
<th>California State Science Standards ♦</th>
<th>Environmental Science Themes 1</th>
<th>Human survival depends on developing practices that will achieve sustainable systems.</th>
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<td>Environmental problems have a cultural and social context.</td>
<td>Environmental Science Themes Subtopics ♦</td>
<td></td>
</tr>
</tbody>
</table>

### Earth Science (cont.)

**#9 California Geology** – The geology of California underlies the state’s wealth of natural resources as well as its natural hazards. As a basis for understanding this concept:

- a. Students know the resources of major economic importance in California and their relation to California’s geology.
  - Science
  - Energy conservations
  - Earth itself
  - Humans
  - Environmental problems
  - Human survival

- b. Students know the principal natural hazards in different California regions and the geologic basis of those hazards.
  - Science
  - Energy conservations
  - Earth itself
  - Humans
  - Environmental problems
  - Human survival

- c. Students know the importance of water to society, the origins of California’s fresh water, and the relationship between supply and need.
  - Science
  - Energy conservations
  - Earth itself
  - Humans
  - Environmental problems
  - Human survival

- d. Students know how to analyze published geologic hazard maps of California, and know how to use the map’s information to identify evidence of geologic events of the past and predict geologic changes in the future.
  - Science
  - Energy conservations
  - Earth itself
  - Humans
  - Environmental problems
  - Human survival

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2 These six environmental principles are based on the environmental principles from the College Board’s Advanced Placement Program (AP) Environmental Science course. The spreadsheet shows how these principles connect to Science Content Standards for California Public Schools, K–12.

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Contextualizing English and Environmental Science Education

SAMPLE ENVIRONMENTAL RESEARCH INTERNET WEBSITES

Lesson 1, Activity 3

Farming:
http://www.treehugger.com/green-food/4-farming-methods-that-go-beyond-organic.html

Greenhouse Gases/Climate Change:
http://epa.gov/climatechange/ghgemissions/
http://climate.nasa.gov/causes/

Recycling:
http://www.planmygreen.com/recycling/best-recycling-methods/
http://earth911.com/recycling/

Green Consumerism:
http://www.gdrc.org/sustbiz/green/a-consumerism.html

Cogeneration:
http://sustainability.yale.edu/co-generation
http://www.cogeneration.org/

Urban Sprawl:
http://www.policyalmanac.org/environment/archive/urban_sprawl.shtml

Organizations/References:
Environmental Protection Agency: http://www.epa.gov/
Environmental Literacy Council: http://www.enviroliteracy.org/

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TOPICS FOR SUMMATIVE ASSESSMENT
Lesson 4, Activities 1 & 2

The teacher will select topics for a summative assessment. Potential topics include the following:
1. Renewable/alternative energy: Is it a realistic, feasible alternative?
2. Ozone depletion: causes, changes, future.
5. The San Onofre power plant’s history and its future.
6. Invasive species in Southern California: Problem plants and animals in California habitats. What are they? Where did they come from? Why are they here? What are some environmental/ecological solutions to this problem and their associated costs?
7. California fisheries regulations, laws, and the ecological reasoning behind them.
8. Recycling? Does it really help? How so? What still needs to be done? How does recycling use in the United States compare with that of other nations?
9. Municipal water treatment facility for Ontario/Chino: How do urban centers handle water treatment? How does it work? What are some progressive approaches to this age-old problem?
10. Land preservation acts, green space, and open space: Their value and costs. What are some successful plans that have already been implemented?
11. Compare and contrast the major environmental organizations (National Audubon Society, Sierra Club, Defenders of Wildlife, Greenpeace, The Nature Conservancy, The National Wildlife Federation, Earth First!, etc.). What are their goals? How do they differ? What actions have they taken to try to accomplish their goals? Have they been successful? How do you measure success?
12. Organic vs. traditional farming methods: Which method is more productive, and which is more environmentally benign?
13. In the western United States, water quality and supply is a serious concern. Discuss this issue from the perspective of farmers, ranchers, developers, and environmentalists.
14. Evaluate the local city plans for a recycling program for paper, aluminum, plastic, and glass. What are its strong and weak points? How could it be made more efficient?
15. Scrap yards: What can they recycle, and what can’t they recycle? What do they pay for recycled materials? Why does the market fluctuate so much? How much do they make in this business?
16. Cogeneration: Cities that burn their garbage for heat and electricity. (Examples include Harrisburg, PA; Columbus, OH; Long Beach, CA; and Akron, OH.)

17. There is a lot of land, so why are we running out of landfills? What makes it hard to find acceptable sites for them? How safe are landfills?


19. Some parts of Antarctica are badly polluted. How? Why? Who owns Antarctica? How does tourism impact the environment in Antarctica? What are the costs?

20. Supertankers and oil spills: Their ecological aftermath. How well did Alaska survive the Exxon Valdez tragedy? Have there been larger or more destructive spills?

21. The BP gulf oil disaster: How has the environment been affected? Are things truly “cleaned up”?

22. A conflict of interest: Fishermen vs. oil drilling on America’s most fertile fishing grounds.

23. Acid rain: California as both a source and recipient.

24. The health effects of indoor air pollution: How does home or business insulation expose us to toxic chemicals?

25. Mercury (or lead or cadmium) in the environment: Where does it come from and how does it affect us?

26. Carcinogens in the environment: How do we test for them, and are they worth the time to worry about and deal with them?

27. Are you a travel and tourism enthusiast? Write on ecotourism—nature tours, African safaris, swimming with dolphins, etc. Are these experiences beneficial to host countries and to the animals? Are there unintended consequences?

28. Chemical pesticides: An agricultural blessing or an ecological disaster? Why don’t we make greater use of biological pesticides, such as insect pheromones?

29. City planning: How can you build an environmentally sound, beautiful, energy-efficient, recycling urban society?

30. Mass transit is a way to save energy and reduce pollution. Why do so few cities use it?

31. America’s love affair with the car: How it affects our energy and resource supply and the environment. How would things change if the rest of the world had as many cars per person on average as Americans do?

32. Design an energy-efficient home (i.e., create a very specific blueprint).

33. The debt crisis and the Third World: How does the interest burden from huge loans prevent developing countries from pursuing ecologically smart strategies? What role does the World Bank play in international conservation?

34. Why forest fires aren’t always bad.

35. Must business and environmental protection always be at odds? Can environmentalism be good business?

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For more information contact:

Shelly Valdez, Ed.D
IEBC Director of Educational Collaboration
svaldez@iebcnow.org