

OUR ECOLOGICAL EFFECT ON THE WORLD- Craig Miller

I. Begin with the End in Mind

Project Theme

Ecology

6. Stability in an ecosystem is a balance between competing effects.

[Taken from the [California State Science Standards](#) for 9-12th grade Biology.]

The *Essential Understandings* (BIG IDEAS still understood in 10 years):

*****Ecology is a "Snap Shot" of Evolution (what the world looks like right now); but it will change...guaranteed! In other words, the only constant on the planet earth is that NOTHING ever stops changing!**

*****Humans are currently the greatest disruptive force on the planet, but there are many different ways to work in solving the Earth's environmental problems.**

Content Standards

Ecology

As a basis for understanding this concept:

- a. *Students know* biodiversity is the sum total of different kinds of organisms and is affected by **alterations of habitats**.
- 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.
- 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.
- e. *Students know* a vital part of an ecosystem is the stability of its producers and **decomposers**.

[Taken from the [California State Science Standards](#) for 9-12th grade Biology.]

Focal points **highlighted**.

NOTE: In order to include Social Science, the Essential Understandings above are easily tailored towards including governmental policies and the work of NGOs.

Key Skills

*Ability to log data over time into charts in order to make graphical comparisons using a spreadsheet program (i.e. Excel)

*Ability to collect information from various types of resources (e.g. local first hand experts, online collaboration with experts-videoconferencing?, online text sources, videos, etc.)

*Ability to summarize what has been learned, create solutions, and present it on the internet using a Web 2.0 technology (i.e. blog or wiki).

*Respectful Communication with teammates. Listening to others before responding and not making ideas personal. Intellectual disagreements remain civil.

Habits of Mind

*Creating, Imagining, Innovating (as well as managing impulsivity):

Students should know that they will be contributing their project to the worldwide community (on the internet). This requires them to deliberately plan ahead, and creatively think of something worth saying. Their solutions to world problems should inspire their audience to act. (This also makes their work real/authentic)

*Taking responsible risks (as well as persisting):

Students should select issues with which they are unfamiliar in order to broaden their world view. Students should work through their confusion/discomforts so that they confidently feel their suggestions are valid (a self-esteem builder).

II. Craft the Driving Question

Driving Question

What effects do the agricultural decisions we make in the Pajaro Valley (Central Coast of California, U.S.) have on the environment or inhabitants of the planet?

SubQuestions

**What Control do we have over agriculture in the Pajaro Valley?*

- *What are the chemical consistencies of the soil we use in our valley?
- *What effects do these chemicals have on living organisms (how much is needed for overexposure)?
- *What types of crop rotation do we observe in our valley? How often?
- *How many crops need to be planted in order to reduce water run off?
- *How often do we need to import new soil?
- *What types of additives do we use on our valley crops (fertilizers/pesticides)?
- *What are the chemical consistencies of these additives?
- *What effects do these chemicals have on living organisms (how much is needed for overexposure)??
- *What types of farm equipment do we use in our valley?
- *How are these pieces of equipment powered?
- *What are the chemical consistencies of the fuels we use in our valley?
- *What effects do these chemicals have on living organisms (how much is needed for overexposure)?
- *What chemical byproducts are given off by the burning of these fuels?
- *What effects do these chemicals have on living organisms (how much is needed for overexposure)?
- *How much water is needed by our valley for crops?
- *Where does the water come from?
- *What are genetically engineered seeds? Do we sue them?
- *What are the short-term & long-term results of using genetically engineered seeds?

**Where do our agricultural products (crops/additives/byproducts) go?*

- *Where does the excess crop water go?
- *How much soil/soil additives run off with the water?
- *Is any of the water consumed by humans as drinking water? Where? How much?
- *What types of crops do we export?
- *In what other forms do we export our crops (meaning canned or bottled)?
- *Where do we export these crops? (Give numbers detailing where we send the most)

**Who interacts with our agricultural crops/additives/byproducts?*

**Who in our community interacts with agriculture the most?*

**What health issues do the migrant community face?*

How are their children affected?

**What is the effect on crops & the organisms (insect/fungi/bact.)*

who live on the crops?

**Which animals in the sloughs, coastline and Monterey Bay affected?*

**How are these animals affected?*

**How are the people who import our crops affected?*

**How is the Earth's temperature affected by our activities in the valley?*

**What are the major problems we are causing through our agricultural practices (use data to back up your statements)?*

**How can we best solve the problems we are causing through our agricultural practices (again, use data to back up your statements)?*

III. Plan the Assessment

Early in the Project:

Content Standards=

- a) An **individual brainstorm** Concept Map/Outline (see HoM below) listing all possible ways in which our community of humans affects the environment elsewhere is a core state ecology standard.

[Formative Multiple Product]

Skills=

- a) Respectful communication in a **group brainstorm** Concept Map/Outline (see HoM below) demonstrating an openness to listen/validate each person's contribution(s), and "intellectual" rather than personal disagreements.

[Formative Multiple Product]

Habits of Mind=

- a) An **individual brainstorm** Concept Map/Outline listing all possible ways in which our community affects the environment elsewhere requires *imagination/creativity*.

[Formative Multiple Product]

- b) Once groups are determined, a **group brainstorm** Concept Map/Outline requires *creativity/innovation* in determining how we will gather information to support/invalidate our hypotheses.

[Formative Multiple Product]

During the Project:

Content Standards=

- a) Every piece of data collected in **field work Labs** MUST be DIRECTLY related to either a standard or theme for the unit. Students will label each activity with the standard to which it connects.
[Formative (collected over time) Multiple Product]
- b) All **interview question Lists** that students create MUST be DIRECTLY related to either a standard or theme for the unit. Students will label each activity with the standard to which it connects.
[Formative Multiple Product]
- c) All **text source Research** MUST be DIRECTLY related to either a standard or theme for the unit. Students will label each summarized conclusion with the standard to which it connects.
[Formative Multiple Product]

Skills=

- a) Log data samples taken during **field studies Labs** and entering into Spreadsheets. Using the spreadsheet tools to make the information visual.
[Formative Multiple Product]
- b) Collect **Notes** through **text sources**.
[Formative Multiple Product]
- c) Collect first-hand information through **interviews**. Creating **Questionnaire** in advance that will elicit the most information, and accurately recording.
[Formative Multiple Product]
- d) Create **wiki Page(s)** to display the data from spreadsheets, and information from interviews related to effects/problems.
[Formative Multiple Product]
- e) Create **blog Page(s)/Entries** to display additional interview information related to solutions.
[Formative Multiple Product]
- f) Peer Review of group members' efforts in researching **text sources**, **interviews**, and creating **wiki/blog** pages.
[Formative Multiple Product]

Habits of Mind=

- a) Employ innovative techniques for collecting **Notes** from a **variety of sources** that the group may use.
[Formative Multiple Product]
- b) Take risks in **collecting/presenting** information.
[Formative Multiple Product]

End of the Project:

Content Standards=

- a) Present scientific terminology posted on [Wiki Page\(s\)](#) and displayed through a projector for other classes at school detailing the ecological problems of how, where, and who our community affects around the globe.
[Formative Multiple Product; however, will eventually become Summative Culminating]
- b) Present scientific terminology posted in a Group [Blog Page\(s\)/Entries](#) and displayed through a projector for other classes at school detailing the progress of groups working to lessen our impact upon the environment, and contact steps for getting involved.
[Formative Multiple Product and designed to be ongoing indefinitely]
- c) Present scientific terminology in an [audible presentation](#) to the school's classes.
[Summative Culminating]

Skills=

- a) The ability to [audibly communicate](#) summary findings with an audience clearly and confidently.
[Summative Culminating]
- b) The ability to [post content](#) to the internet using [Web 2.0 tools](#).
[Summative Culminating]

Habits of Mind=

- a) Be creative in [presenting](#) information to the school. Grab the attention of the audience.
[Summative culminating]

IV. Plan the Assessment II

Exemplary Performance Criteria for each product

Product: **Individual Brainstorm (Early)**

Criteria:

- *Pre-write: List in pencil 10 ways in which humans affect the environment.
- *List in pencil 10 ways in which our human community has an effect outside our valley.
- *Creativity must be displayed...At least 3 items must be [indirect](#) effects.
- *Exchange paper with a peer in order to have the grammar mistakes identified using a different colored writing utensil.
- *Correct the grammar/spelling mistakes in pen.

Product: **Group Brainstorm (Early)**

Criteria:

- *Pre –discussion: List 3-5 rules the group agrees upon to ensure civil interaction.
- *Pre-discussion: Each student reads items on their personal brainstorm. Group comes to a consensus in deciding which items are the most correct & which are the most creative. Highly correct & creative items are highlighted on paper (one color for correct & one color for creative). At least one of each should be highlighted per person.
- *Based upon each highlighted item, group agrees on one or two information collecting strategies for each effect.
- *For the creative items, group proposes innovative ways to research the effect.
- *Group lists 3-5 difficulties in communication during the activity.
- *For each difficulty, group proposes a way to avoid the problem next time.

Product: **Field Studies (During)**

Criteria:

- *Carefully read and follow directions in order to avoid needing to repeat steps/waste materials/run out of time/protect the environment.
- *Carefully log data into the correct entry locations.
- *Double check mathematical calculations.
- *Re-read results and conclusions for clarity, accuracy, & grammar, and correct.
- *Have a partner read over conclusions looking for clarity, accuracy, & grammar.
- *Make final corrections.

Product: **Interviews (During)**

Criteria:

- *Work with partners to list questions that will elicit answers to the Driving Question and it's SubQuestions.
- *Work with partners to arrange a logical order to questionnaire(s).
- *Contact experts.
- *Determine method for interview.
- *Set time, "arrive" promptly, act professionally.
- *Record/transcribe answers.
- *Summarize and post answers.
- *Write Thank-you to those who were interviewed.

Product: **Text Research (During)**

Criteria:

- *Work with partners to determine which sources are best for answering the Driving Question and it's SubQuestions.
- *Copy passages and list the sources where they came from. [Note: Wikipedia may ONLY be used as a beginning point for research! No direct quotes!]
- *Summarize important points and use direct quotes from identified sources in support.
- *Re-read for clarity, accuracy, and grammar.
- *Make corrections.

Product: Peer Review (**During**)

Criteria:

***Honestly** grade peers in contributions for Interview, Text Research, Wiki, Blog.

Product: Wiki (**During**)

Criteria:

*Each student posts in their own unique color until the Wiki receives final approval.

*Each Wiki Page detailing problems as identified through Field Work, Interviews, and Text Research is to be cataloged with a Screenshot at the end of every week to document modifications

Product: Blog (**End**)

Criteria:

*Each student posts in their own unique color until the Blog receives final approval.

*Each Blog Page detailing problems as identified through Field Work, Interviews, and Text Research is to be cataloged with a Screenshot at the end of every week to document modifications.

Product: Presentation (**End**)

Criteria:

*3 x 5 note cards with bullet points.

*Summarize *main points* of what learned (DO NOT READ OFF PROJECTED IMAGE).

*Describe unique methods employed during the process of completing the project.

*Describe difficulties & how overcome.

*Clear, Loud speaking (NO laughter, stammering, etc.)

*Good Posture and good Eye contact with audience.

*Timing practiced so that multimedia (Wiki/Blog) matches Auditory Presentation.

V. Map the Project

Product: Wiki Summary Identifying Problems/ Blog Entries Describing Solutions/ Oral Presentation with Wiki & Blog Projected on screen & Described			
KNOWLEDGE AND SKILLS NEEDED	ALREADY HAVE LEARNED	TAUGHT BEFORE THE PROJECT	TAUGHT DURING THE PROJECT
1. Typing w/o looking at keys (master school typing program)	X (hopefully)	X (outside class time)	
2. Ability to work collaboratively in a responsible and mature manner		X (prior class labs)	X
3. Ability to summarize the main points of an article into one's own words		X (prior class research)	
4. Ability to act in a professional manner when interviewing an individual/ accurately record & transcribe information			X
5. Ability to diligently record data when in the field, and make conclusions from results.		X (prior class labs)	X
6. Ability to enter data into a spreadsheet, apply equations, and visually represent data			X
7. Ability to efficiently find desired information using a variety of mediums: internet/text/video/podcast, etc.		X (prior class research)	X
8. Ability to add content to a wiki			X
9. Ability to add content to a blog			X
10. Ability to proofread partner's work		X (prior)	X
11. Ability to give clear, professional presentation to community		X (prior)	X

Project Tools:	<ul style="list-style-type: none">* Class-Project Master Calendar/Timeline * Group-Project Master Task List (Where responsibilities for each member is identified & checked off) * Sectioned Journal for handwritten research notes & citations *Word documents for digital research notes & citations *Late/Incomplete items form (filled out by students at defined intervals)
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VI. Map the Project 2

Key dates and important milestones

All dates correspond with the [district calendar](#) for the `08/`09 school year.

Date:	Product Completed:
Fri. Jan. 16, 2008 - Due Same Day	Individual Brainstorm
Tues. Jan. 20, 2008 - Due Same Day	Group Brainstorm
Wed. Jan. 21, 2008 - Due Same Day	Debrief Group Brainstorm & Introduce Entry Scenario & Driv. Quest.
Thurs. Jan. 22, 2008 - Due Same Day	Form Groups & Each Group Creates Its Own Agreements For Proper Interaction
Fri. Jan. 23, 2008	Distribute & Review Project Objectives, Timeline & Send Home Introductory Letters
Tues. Jan. 27 & Thurs. Jan. 29, 2008 (Biweekly through May 14) Final Spreadsheets Due May 15	Record Data From Biweekly Water/Soil Tests @ Designated Campus Locations
Fri. Jan. 30, 2008 (SS Weekly through May 15) (Research Fridays through Feb. 27) Research Due Wed. Apr. 1-No Joke!	Weekly Entering Of Data Into Spreadsheets (SS) & Researching Effects/Levels Of Harm For Chemicals Contacts May Be Emailed To Solicit Info
Fri. Mar. 6, 2008 (SS Weekly through May 15) Interview Appointment Due Fri. Mar. 13	Weekly Entering Of Data Into Spreadsheets (SS) & Emailing "Experts" To Set Up Interviews
Mon. Mar. 16-Thur. Mar. 26 Interview Transcript Due Fri. Mar. 27	Interview & Transcribe & Summarize
Fri. Mar. 27, 2008 (SS Weekly through May 15) Wiki Pages Due Fri. May 8	Weekly Entering Of Data Into Spreadsheets (SS) & Adding Summarized Information To Wiki Pages
Peer Review Due Thurs. Apr. 9	Peer Reviews Of Group Members
Fri. May 15 (SS Weekly through May 14) Blog Posts Due Fri. May 22	Weekly Entering Of Data Into Spreadsheets (SS) & Post Blog Entries Describing Actions In Progress
Tues. May 26-Fri. May 29	Prepare & Practice Presentations
Presentation Due Mon. Jun. 1-Fri. Jun. 5	Present Projects

VII. Manage the Process

Differentiating Instruction

Sharon Longert suggests in her [5 key concepts of differentiated instruction](#), the following steps for educating heterogeneous groups that include second language learners, remedial students, students with diagnosed learning disabilities, and diverse learning styles:

CONTENT

- *Lead students to use websites written at varied levels.
- *Provide organizers/anticipation guides for collecting information.
- *Use examples that directly relate to student experience.

PROCESS

- *Employ cooperative grouping.
- *Use activities that encourage and accept a variety of perspectives/opinions.
- *Share learning objectives at the beginning, and continually refer to them during the process.
- *Use numerous checkpoints along the way for formative assessment & reflection.

PRODUCT

- *Carefully modify rubrics for selected individuals with special needs.
- *Teach students to use a range of technologies and allow for student choice.

AFFECT

- *Model respect.
- *Reinforce open-mindedness.
- *Require equity is student contribution to their group (does NOT mean that all students will complete each aspect of the project. Encourage equity of labor division according to strength/interest.).
- *Support practice with guidance and timely assessment/reflection
- *Allow for group choice in nearly every aspect of the project except state standards that will be learned.
- *Allow for group modification of assignments (with justification for change given and permission granted).

ENVIRONMENT

- *Place students in comfortable group setting.
- *Clearly identify resources and make them freely available for the taking as needed.
- *Allow freedom in procedural aspects of the course. In order to encourage collaboration/creative thinking, students should be given a default green light to create their own group processes, procedures, labor divisions, and task lists. Instructor(s) should be available for input, but not be required to approve every action the group feels strongly about (only the ones that might require modifying the overall project).

LEARNING STYLES

In terms of [learning styles](#), the variety of activities/policies built into the project will play to different student strengths:

Individual Brainstorm: solitary learning, logical, visual (imagination)

Group Brainstorm: social learning, auditory, verbal, logical

Field Studies: kinesthetic, visual, logical, solitary or social depending on group

Interviews: auditory, verbal, social, perhaps visual depending on medium

Text Research: verbal, logical, visual (images), solitary

Wiki: kinesthetic, visual (images), verbal, logical, solitary

Blog: kinesthetic, visual (images), verbal, logical, solitary

Presentation: kinesthetic, verbal, logical, visual, social

EVALUATION OF PBL PROCESS

Class discussion (Informal): During the process, the class will repeatedly come back to discuss the benefits and drawbacks of PBL.

Teacher-led formal debrief: Teacher will lead a formal debrief so that he can make sure all questions are answered.

Individual evaluations: Instructor will have students write an individual evaluation detailing what they thought of the process. This will hopefully reveal feelings that might not come out during a full class debriefing. Student feelings in regards to working in groups during the project may be assessed during the project by adding relevant questions to the peer review.

Presentation: During the summative presentation, there shall be a section included where students must address their overall feelings about working through an open-ended, student-based, long-term project.