



**CEL F Summer Institute '10**

Subject: Math/Pre-Algebra Grade: 7-8th  
Boston Latin School [public] MA Teacher: Kimberly G  
Energy Audit Project: Energy Efficiency in your Home  
Lesson Overview and Introduction

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Lesson

Written By

Scatterplots: Ecological Footprint and the Human Development Index.....(Sarah) Mei Lau

- Please note this lesson was turned in separately by the author.

Percent of Change: Your Ecological Footprint.....(Sarah) Mei Lau

- Please note this lesson was turned in separately by the author.

Systems of Equations: Looking at Energy Costs.....Kimberly Green

- Lesson Overview
- Student Handout & Homework

Energy Audit Project: Energy Efficiency in your Household.....Kimberly Green

- Project Overview
- Student Handout & Rubric

## Introduction

Mathematics, as a discipline, has its own special set of challenges in integrating sustainability into the regular curriculum. Unlike other disciplines where the big ideas of sustainability can be richly integrated into the daily curriculum, mathematics requires a different approach. The majority of the time on task needs to be spent on the mathematics of the topic and looking at mathematics as a tool needed to get at many of the bigger ideas of sustainability. The integration is possible by using examples from sustainability that can be brought into the classroom to teach mathematical concepts. This method was found to be the most practical in creating integrated curriculum.

The three lessons and project, created by my colleague and myself, all center on the common theme of the Ecological Footprint which allows mathematics to be used as a tool in the integration of several big ideas of sustainability: limits, long term effects, change over time, ability to make a difference, and systems. The progression of the lessons was designed in such a way as to allow students to look at the Ecological Footprint from a global perspective first and work down to their own personal footprint and what actions they can do to lower it.

The first lesson, written by my colleague, is on scatterplots and looks at the relationship between Ecological Footprint and the Human Development Index in various countries around the world. Outliers to the data set will be examined and implications will be addressed.

The second lesson, also written by my colleague, will be on using personal ecological footprints to teach the concept of percent of change. Students will calculate their personal ecological footprint and look at ways they can lower it. Students will calculate percent of change in their ecological footprint for several actions as well as what percent of change is needed to reach biocapacity.

The third lesson will use the cost of light bulbs over time to teach systems of equations. Students will write linear equations to represent two types of light bulbs and calculate the time needed for the more energy efficient bulb to be more cost effective by solving a system of equations. Students will reflect on their personal consumer choices and address other factors involved in making purchasing decisions.

The project will be a culmination of the second and third lessons. Students will do a mini energy audit on a household electrical item and research on a more energy efficient model. Students will calculate the energy savings for one day (as a percent of change) and determine the time needed for the more energy efficient model to pay for itself (as the solution to a system of equations). Students will create a poster and give a presentation of their findings and what they mean to them as a consumer.

The work in these lessons and project only touches upon the surface of what is possible in the integration of sustainability into the Pre-Algebra curriculum. We plan to work on the development of several other lessons using the sustainability lens. Some of the additional lessons in development are:

- Regeneration in the local lobster industry in teaching about rate of change, slope, graphing and writing linear equations.

- Minimizing surface area (using less material) while maintaining the volume in cereal boxes as a way of lowering a company's ecological footprint.
- Bottled water consumption in our school to teach rates, proportions, percents, and volume. Students will calculate the daily bottled water consumption at the school, the percent of those bottles that are recycled, and the percent thrown in the trash. Then students will calculate what this looks like for a year and how much trash this generates. This example can tie in a number of other concepts taught in the pre-algebra curriculum as well as spear-head students to campaign for a more bottle-free school.