



Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
2004 Volume IV: Energy, Engines, and the Environment

Introduction

We examined issues related to energy, engines and the environment, all of which permeate many aspects of our life and are becoming more and more cogent, as we face short-term and long-term energy crises. This seminar was offered under the premise that a group of educators, the Fellows, would be able to adapt a scientific and sometimes dry subject to a broad student audience, encompassing kindergarten and high school students, capitalizing on a wealth of both traditional and Web-based resources. Many of the Fellows had little or no science background.

The seminar series began considering energy fundamentals. Key concepts included various forms of energy, work and heat as energy transfer, conservation of energy, first and second laws of thermodynamics, all of which are typically dealt with in thermodynamics. Such a discipline tends to be rather dry and often turns off even advanced students. The identification of some introductory books and Web sites helped the Fellows wade through this material.

We then examined a variety of energy conversion systems, starting with traditional fossil-fuel based engines, such as steam engines and internal combustion engines, and their cycles. Despite the press coverage of new and revolutionary approaches, I believe that fossil fuel energy systems will be the dominant source of energy for at least several more decades. In the near term, efforts should be made to make it cleaner and more efficient rather than overselling pie in the sky alternatives as a panacea for the energetic problems of the planet. We also examined a broad range of energy conversion examples, including recent innovations, such as fuel cells, hybrid gasoline/electric engines, solar energy systems and wind farms. Although more and more fashionable, at the present time and for the foreseeable future, they cover only niche markets of the world's energy.

The third component of the seminar series focused on the issue of sustainability and the environment from an energy perspective. We discussed pollution from the various energy conversion systems, the big picture and what it will take to address world energy needs in the long run.

The Fellows absorbed these materials and adapted it not only to traditional science curricula, as expected, but, to my surprise, also to curricula in social sciences, art and history. Examples of the latter cover disparate topics ranging from the effect of energy harnessing on coal-mining culture, to the consequences of the advent of heat engines on the growth of cities in America, to the aesthetics of designing form and function around machines, to how to use energy responsibly in the context of food consumption and the obesity epidemics in children. Even poems were written to stimulate young children in the teaching of an often abstract topic. The originality of some of the units developed from a science seminar was inspirational.

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