

## On Instruction of the First "R" of Environment

S. Kant Vajpayee  
The University of Southern Mississippi

### Abstract

The instruction of environmental issues is no longer limited to science and humanities educators. An increasing number of engineering and engineering technology programs are incorporating courses on environment in their curricula. At The University of Southern Mississippi the introductory course *ESC 301: Living in the Environment* is one of the several we offer. It is an elective within the university core curriculum. Many engineering technology majors take ESC 301, which I have taught for the last five years. One of the themes of my instruction is the role individuals can play in sustaining the environment. I strongly emphasize the *three Rs of the environment* (Reduce, Reuse, and Recycle). Their hierarchy is pointed out too; thus, *reduce*--the first R--is more effective than the other two. Without undermining the current efforts toward recycling, I encourage my students to appreciate the superior effectiveness of the first R. Often I find them perplexed since the first R is easily construed as giving up the *good life*. Further explanations clarify that the first R can be practiced also by getting rid of all types of waste, including those due to inefficient design, manufacture, and operation of systems.

### Introduction

The process of globalization is in full swing. While the contributions of trade and technology such as the internet to this process are obvious, most people fail to realize the role of the environment. The enormous growth in industrial activities during the last four decades has been having profound effect on the environment, both in terms of resource depletion and pollution. We in the academia are responding by conducting basic research on environmental issues as well as through instruction. Most colleges and universities offer environment-related courses. This article discusses how I highlight the importance of the first R (*reduce*) of environment in my teaching.

### The course

At The University of Southern Mississippi we offer *ESC 301: Living in the Environment* as a three-credit-hour elective within the General Education Curriculum. As an introductory course with annual enrollment in hundreds, ESC 301 attracts a variety of majors, including engineering technology. Most enrollees are liberal arts major, while some are non-degree adult students. Besides discussing the strong correlation between human population and environment degradation, we cover most problems of pollution and resource depletion. Sustainable development and a worldview of the environment are the integrating themes. While several relevant topics are covered in ESC 301, I make special efforts to emphasize the first R.

### The three Rs

Similar to the secondary education's purpose embodied in its three Rs--*Reading, 'Riting, and 'Rithmetic*, there are three Rs of environment-friendly living, namely *Reduce, Reuse, and Recycle*.

Students are generally more aware of the last R--*recycle*--since they see and hear about it, and often practice it themselves. The three Rs are used as a *mantra* to keep student perspective in focus. This mantra highlights the three possible ways of achieving and maintaining sustainable development. While discussing their effectiveness, I also point out their hierarchy. The one appearing first, namely *reduce*, is the most effective of the three, though it is generally least attractive. *Reuse* is looked down as inconvenience in a throw-away society. It is not surprising, therefore, that we find it relatively easier to embrace recycling over reduce and reuse.

On the first R

The first R (reduce) denotes all the actions we can take to lower consumption or use. *Consumption* results in the disappearance of the item, as in drinking beer. *Use*, on the other hand, is a special type of consumption in which the item survives, though its value or life is shortened by the use, as in using an automobile. Consumption and use are therefore different--one relates to single-use while the other to multi-use. However, both require the production and distribution of goods and services. The practice of first R lowers production and distribution, thereby improving the environment *at the source*.

From an environment viewpoint, the automobile has perhaps been the worst discovery of the human race. Let us see how we can apply the first R to this product. There are two approaches to reducing its adverse impact on the environment:

*Driving Less.* When you walk rather than drive to the local store to buy a magazine, you are practicing this approach which reduces environmental degradation through reduced resource (gasoline) depletion and lower pollution. Car pooling is another example.

*Driving Efficiently.* This approach reduces the harm for a given number of miles driven. Lower gasoline consumption through improved efficiency also results in less pollution. One can achieve efficiency by keeping the car properly tuned, its tires optimally inflated, and so on. Consideration of fuel efficiency, i.e., miles per gallon (mpg) data, while buying a new car is a similar effort.

The (above) first approach is less acceptable in affluent countries where most people are cash-rich but time-poor (cash-rich means here excessive capacity to buy). To walk rather than drive to the local store requires a change in attitude; purely economic reason of doing so may not make sense. People who follow this approach are usually led by a broader desire to lower environment degradation (and/or to get their bodies burn a few calories); they usually love and respect nature. They know the difference between economic and ecological values; they know for instance that a tree's economic value of \$500 is awfully lower than its ecological value of \$200,000. In less-affluent countries, this approach of practicing the first R is routine, al beit out of necessity.

The second approach of operating an automobile at high fuel efficiency may be more appealing to most people. If they are aware of the economic benefits, they will do so. This approach is thus an indirect one in which the environmental benefit is a derivative of the economic benefit. The modern consumer may be more willing to adopt this economics-driven approach.

## *Who Pays?*

Burning gasoline degrades the environment also through pollution. We do not take this fact into account while pricing gasoline, primarily for historical reasons but also because of the fear that it may adversely affect our economy. The environmental cost of driving a car is therefore externalized--all of us paying indirectly through suffering from polluted air, rather than the driver paying for it through higher gasoline tax. If we were to internalize this cost so that the driver pays for the pollution, the gasoline would be costing \$5 a gallon at the pumps, as in other countries.

## *Is First R the Anti-Thesis of Development?*

Of the two approaches of practicing the first R, as discussed above, the first one is the very anti-thesis of economic development. Development is measured in terms of the increase in production which is driven by consumption. Decreased consumption will slow down development and may lower the gross domestic product (GDP). It thus contradicts what most people live for-- the enjoyment of the *good life* through as much consumption of goods and services as possible.

We thus find ourselves in a dilemma with the first approach. If we were to cut down consumption for the sake of the environment, we might impede the growth in economy and jobs, and thus in our standard of living. Obviously, the second approach through improved efficiency is more practical than the first one. The first approach would not be practical until we undergo a cultural change to accept that more goods and services do not necessarily bring more happiness!

The second approach of practicing the first R through waste reduction is quite feasible. Though some industries may be hurt in the beginning by this approach, in the long term industries will benefit, as argued by *The Economist*<sup>1</sup> and *The Futurist*<sup>2</sup>. Over the years, we have become wasteful, thanks to the forces of free market economy that try to make our lives better. But Americans are fast learners and can unlearn the wasteful habits if so convinced. For the sake of the environment, we need to bring about<sup>3,4</sup> a cultural change against waste--a daunting task indeed.

## *U.S. is the Most Populous Nation!*

With 1.2 billion people, China is the most populous nation on the basis of head count. But, on the basis of environmental impact the U.S. is the most populous nation. Our high standard of living enables an American to take, and discard back, several times more from the environment than a Chinese. On the basis of per capita GDP, each American is equivalent to ten Chinese. Hence our head count population of 270 million is really 2.7 billion on the basis of consumption and pollution. This issue often leads us as a nation into trouble with developing nations when we talk about international cooperation toward sustainable development.

## Concluding Remarks

It is becoming obvious that environmental issues must be covered in engineering and engineering technology curricula. Our graduates need to realize the importance of *green* design, manufacture, and distribution, as well as of the need to operate technical systems at their highest efficiencies. Of the three Rs of the environment, the first R (Reduce) is the most effective. This article discussed how the importance of first R can be emphasized in an introductory environment course.

International implications of high standards of living in affluent countries suggest that we realize that we share the Earth together.

#### Bibliography

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#### S. KANT VAJPAYEE

S. Kant Vajpayee is a professor at The University of Southern Mississippi. He has been a faculty for more than twenty-five years at four different universities in India, England, Canada, and the US. He has authored four textbooks and published/presented more than one hundred articles in manufacturing and mechanical engineering, or on environmental issues. Dr. Vajpayee has held research grants in excess of a million dollars. He received bachelor's and master's degrees in India and PhD degree from The University of Birmingham in England—all in mechanical engineering.