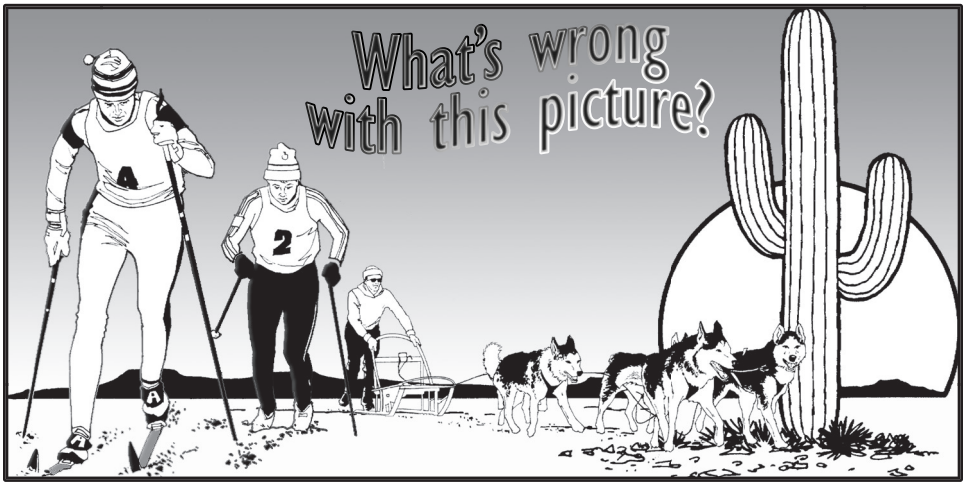
Learning Cycle One

The Right Fit

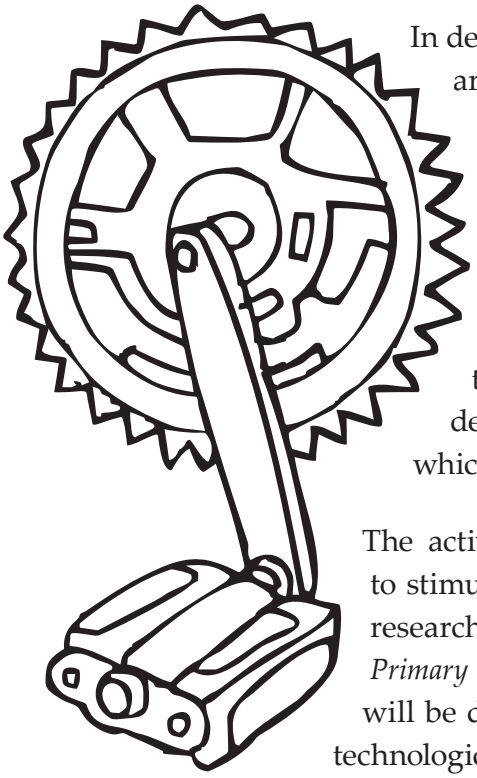
1

Introduction

HAVE YOU HEARD THE SAYING, "IF THE SHOE FITS, WEAR IT?" How does this saying apply to technology? Can't all technological solutions "fit" all similar technological problems regardless of the location? Not necessarily. Some technologies that work perfectly well in one society or culture do not work at all in another. Problems require not only solutions, but well-thought out and planned solutions that "fit" into the culture, society, or community in which they will be utilized.



Appropriate technology is a term often used to describe technological problem-solving in a community that takes into account sustainable approaches. In other words, the solution fits the community's resources, capabilities, and customs. Often, lower levels of (simpler) technology are the most reasonable solutions because approximately eighty percent of the earth's population lives and works in an environment where high technology solutions would be inappropriate. Solutions must then be evaluated in light of the community's environment and customs. It is important to consider how the solution will impact the people both positively and negatively.



In designing your *Primary Challenge* solution, you are required to research the nation that will use your completed transportation device. This research should be focused by the principles of appropriate technology. Your solution should fit into the nation's resources, capabilities, and customs. As you work through this learning cycle, try to determine how your transportation device will be sustainable to the nation in which it is implemented.

The activities in this learning cycle are designed to stimulate that thought process. You will first be researching the nation you were assigned in the *Primary Challenge.* During the *Engagement* phase, you will be designing and constructing a device that is technologically appropriate for a developing nation.

Objectives

After completing this learning cycle, you will be able to:

1. Explain the principles of appropriate technology.
2. Determine how to analyze the risks and benefits of a design.

Consider This

How can a technology be sustainable?

Exploration

Appropriate technology solutions are often small in scale, energy-efficient, environmentally sound, labor-intensive, controlled by the local community, and sustained at the local level. What does that mean? The solution fits the community and minimizes the negative impacts on the citizens' way of life. For example, it would not be appropriate to use nuclear power to solve a local energy generation problem in a village that has yet to discover electricity. Appropriate technology is chosen by designing solutions that are low cost, use local materials (when possible), employ local skills and labor, are affordable and flexible, can be maintained by the community, and involve renewable resources. In addition, designers using an appropriate technology approach take into consideration the various economic, political, geographic, environmental, and social issues facing a country before recommending a solution to a problem.

Inventor's Logbook

Logbook 1.1

In your *Primary Challenge* teams, you will choose one of the client nations listed in the *Primary Challenge* (Ecuador, Ethiopia, Haiti, India, Indonesia, Lebanon, Mali, or Nicaragua) and complete the profile sheet on the following page. You will have to conduct research either on the Internet or at the library to complete the profile sheet. On completion, you will have a comprehensive analysis of conditions in your chosen nation.

After you have completed the profile sheet and answered the *Reflection* questions listed on page 24, you will need to prepare a multimedia presentation that highlights the conditions of the nation.

Nation Investigation Sheet					
Name of country and continent:				Capital city:	
Geography		People		Government	
Economy		Culture			
Resources: record all of your resources in this area					

Reflection

In the Inventor's Logbook space provided, answer the following questions.

Inventor's Logbook

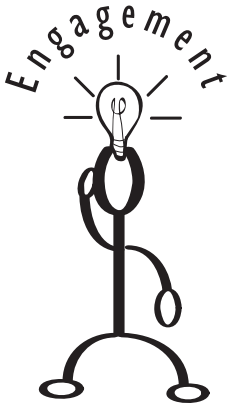
Logbook 1.2

1. Based on your research about the country you have chosen to study, list some of the nation's environmental issues.

2. Again, based on your research, what are some potential industries that would bring economic growth to this nation?

3. How have political, religious, or cultural matters affected the technological conditions in the country you researched?

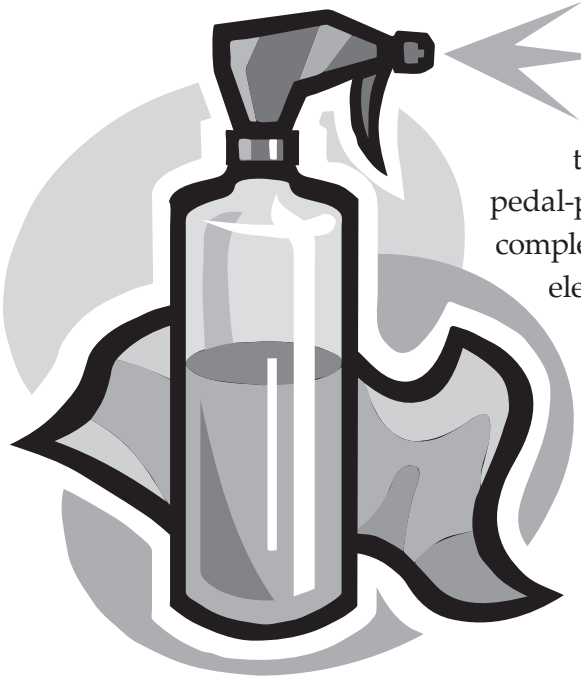
4. How does the nation's per capita income compare to that of the United States?



Engagement

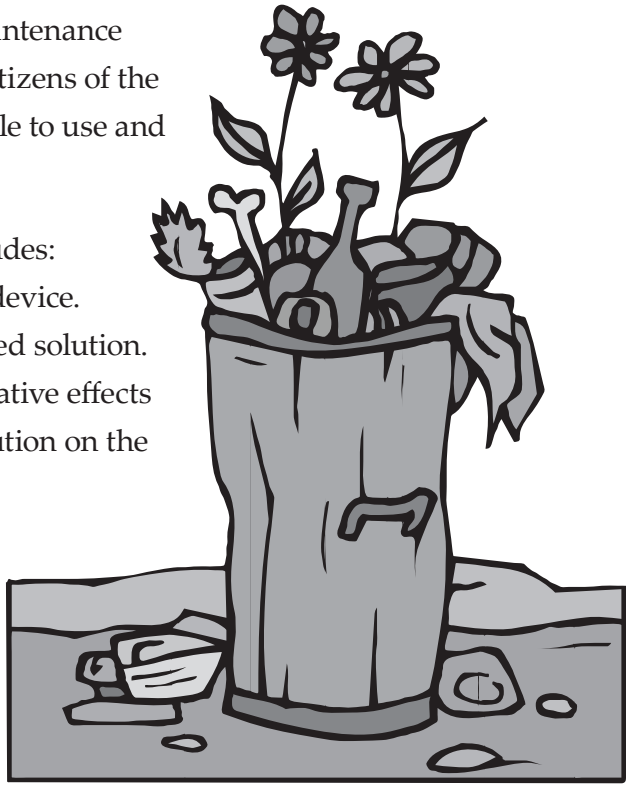
Another renewable and powerful energy source used in appropriate technology solutions is human beings. Incorporating human labor into the solution ensures self-reliance, a comprehension of the technology, and a reduction in environmental impacts. One of the most efficient uses of human energy is through pedal power. A person can generate four times more power by pedaling than by hand-cranking. The leg muscles are simply stronger! A bicyclist's rate of energy consumption is approximately one-fifth of that for an unaided walking person. There are many appropriate technology applications of pedal power, including water pumps and grinders.

In teams of four or five assigned by your instructor, you will be constructing a small-scale, appropriate technology solution using pedal power. In many developing countries, construction techniques do no incorporate high technology devices. Concrete, for example, is often mixed by hand at the building site. This process is long and often produces low-quality results. Your task is to design a model of a low cost, pedal-powered device that could be used to complete a domestic chore. The materials you elect to use should be readily available in most any developing nation.



Follow the directions below to design and construct your device:

1. Select a country where your solution will be implemented and identify the available materials, equipment, and resources.
2. Use only recycled or freely obtainable materials.
3. Submit a list of materials to your instructor and, with your instructor's help, gather the materials.
4. Develop a device that will complete a domestic task. Think about a task that really needs to be accomplished in this nation.
5. Develop an operations and maintenance manual that ensures that the citizens of the country you selected will be able to use and repair the device.
6. Create a presentation that includes:
   a. A demonstration of your device.
   b. The merits of your designed solution.
   c. Potential positive and negative effects of implementing your solution on the country.
   d. A discussion of the operations and maintenance manual.



Inventor's Logbook

Logbook 1.3

As a class, discuss the following questions:

1. What was the most difficult obstacle that had to be overcome while designing your pedal-powered device? How did you overcome it?

_____

_____

_____

2. What did you learn about the country you selected that influenced the design of your device?

_____

_____

3. Why would creating an operations or maintenance manual be important?

_____

_____

4. How important is it to research and understand the nation, country, or community before designing a technological solution?

_____

_____

5. What are some other applications not mentioned that could use pedal power?

_____

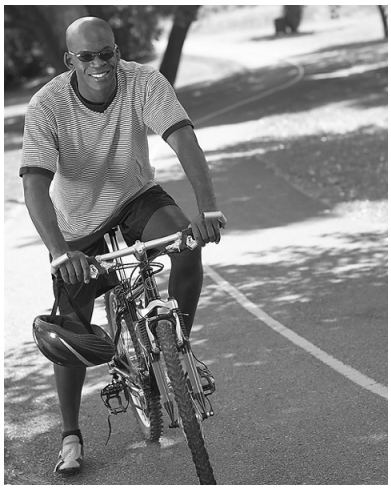
_____

Expansion

1. There are many different self-sufficient energy products that have been developed. One is the hand crank radio. Research the history, development, and current status of the hand crank radio. Present your findings to the class.

2. Pedal power is obviously derived from the bicycle. There are many available configurations of the modern bicycle currently on the market. Research arm-powered, recumbent, and folding bicycles. Prepare a presentation discussing these three bicycle configurations. Include three different pictures of each.

3. Wind is another powerful energy source. Windmills, for example, convert wind energy into electrical power. Research how windmills work and how much energy can be produced by the wind. Present your findings to the class.



Career Connections

Industrial Designer
Civil Engineer
Product Designer
Social Scientist

Here are some careers related to this learning cycle. For more information, visit the United States Department of Labor's Occupational Outlook Handbook at: www.bls.gov/oco

Preparing for the Challenge

As you have learned, understanding the particular needs of the consumer is vital to designing a solution that will be used for a long time. Designing a solution for a community to help improve the situation of its peoples requires an understanding of the culture and environment in which they live. You have already acquired some information about the nation you were assigned for the *Primary Challenge*. What other information do you need to know about your assigned nation to complete the *Primary Challenge*? How can you implement some of the appropriate technologies you explored in this Learning Unit into your solution?

The Right Fit

Name: Date:

Element	Criteria				Totals
	4	3	2	1	
Exploration	Completed profile sheet with exceptional quality and delivered an excellent presentation.	Completed profile sheet with above average quality and delivered a very good presentation.	Completed profile sheet with average quality and delivered a good presentation.	Completed a profile sheet with poor quality; delivered a poor presentation.	
Engagement	Completed a device and manual with exceptional quality and delivered an excellent presentation.	Completed a device and manual with above average quality and delivered a very good presentation.	Completed a device and manual with average quality and delivered a good presentation.	Unable to complete a device and/or manual and delivered a poor presentation.	
Inventor's Logbook Entries	Fully answered all entries and provided good examples.	Answered most of the entries and provided some examples.	Answered few entries and provided few examples.	Did not answer entries and did not provide examples.	
				Total Points	