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ABSTRACT

"Energy: Decisions for Today and Tomorrow" is one of the "Preparing for Tomorrow's World" (PTW) program modules. PTW is an interdisciplinary, future-oriented program incorporating information from the sciences and social sciences and addressing societal concerns which interface science/technology/society. The program promotes responsible citizenry with increased abilities in critical thinking, problem-solving, social/ethical reasoning, and decision-making. This module, designed for grades 7-8 (social studies, general science, earth science, language arts, health education), examines issues underlying the "energy crisis" and values involved in decisions regarding such energy-related issues as energy consumption, distribution, and sources. Subject matter is presented in three sections (oil and transportation, nuclear energy, and coal). The teaching guide includes an overview of the module (purpose; strategies employed, focusing on the dilemma/debate discussion techniques; module structure/objectives; and its use in the school curriculum) and instructional strategies related to the readings, dilemma discussions, and students activities in each of the three sections. A chart indicating moral issues (as defined by Kohlberg) presented in the dilemmas, suggested schedule of activities, and bibliography are also included. The module may be used as a separate unit of study, as a mini-course, or incorporated into existing curricula where appropriate. (JN)

PREPARING FOR TOMORROW'S WORLD

ENERGY:
Decisions for Today and Tomorrow

Teacher's Guide

Institute for Science, Technology and Social Science Education

Preparing for Tomorrow's World
An Interdisciplinary Curriculum Program

Coastal Decisions: Difficult Choices
Energy: Decisions for Today and Tomorrow
Future Scenarios in Communications
Space Encounters
Technology and Changing Life-Styles
Perspectives on Transportation
People and Environmental Changes
Environmental Dilemmas: Critical Decisions For Society
Of Animals, Nature and Humans
Beacon City: An Urban Land-Use Simulation
Dilemmas in Bioethics
Technology and Society: A Futuristic Perspective

PREPARING FOR TOMORROW'S WORLD

Energy:
Decisions for Today and Tomorrow

Teacher's Guide

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PREFACE

TO THE TEACHER:

We live in an exciting, rapidly changing, and challenging world—a world highly dependent upon science and technology. Our world is changing so rapidly that we sometimes fail to recognize that much of what we today take for granted as common, everyday occurrences existed only in the imaginations of people just a few short years ago. Advances in science and technology have brought many dreams to fruition. Long before today's school children become senior citizens, much of today's "science fiction" will, in fact, become reality. Recall just a few accomplishments which not long ago were viewed as idle dreams:

- *New biomedical advances have made it possible to replace defective hearts, kidneys and other organs.*
- *The first aire flight at Kitty Hawk lasted only a few seconds. Now, a little over half a century later space ships travel thousands of miles an hour to explore distant planets.*
- *Nuclear technology—of interest a few short years ago because of its destructive potential—could provide humankind with almost limitless supplies of energy for peace-time needs.*
- *Computer technology has made it possible to solve in seconds problems which only a decade ago would require many human lifetimes.*
- *Science and technology have brought us to the brink of controlling weather, earthquakes and other natural phenomena.*

Moreover, the changes which we have been experiencing and to which we have become accustomed are occurring at an increasingly rapid rate. Changes, most futurists forecast, will continue and, in fact, even accelerate as we move into the 21st Century and beyond. But, as Barry Commoner has stated, "There is no such thing as a free lunch." These great advances will not be achieved with a high price. We are now beginning to experience the adverse effects of our great achievements:

- *The world's natural resources are being rapidly depleted.*
- *Our planet's water and air are no longer pure and clean.*
- *Thousands of plant and animal species are threatened with extinction.*
- *Nearly half the world's population suffers from malnutrition.*

While science and technology have given us tremendous power, we are also confronted with an awesome responsibility to use the power and ability wisely, to make equitable decision tradeoffs, and to make valid and just choices when there is no absolute "right" alternative. Whether we have used our new powers wisely is highly questionable.

Today's youth will soon become society's decision makers. Will they be capable of improving upon the decision-making of the past? Will they possess the skills and abilities to make effective, equitable, long range decisions to create a better world?

It is our belief that the *Preparing for Tomorrow's World* program—will help you the teacher prepare the future decision-maker to deal effectively with issues and challenges at the interfaces of science, technology, society. It is our belief that the contents and activities in this program will begin to prepare today's youth to live life to the fullest, in balance with Earth's resources and environmental limits, and to meet the challenges of tomorrow's world.

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CONTENTS

ENERGY: Decisions For Today and Tommorrow

INTRODUCTION

One needs only to read a daily newspaper or listen to a newscast to recognize that energy is an urgent concern, if not a problem of crisis proportions. To understand the energy problem, however, requires broadening the concept of energy to encompass its inter-relationships with all aspects of our social, political, economic and cultural life. It is, therefore, not a topic to be discussed in isolation but a topic which cuts across the disciplinary lines of subject matter and is deeply intertwined with questions that challenge our cherished American life-styles. These questions concern the continued development and growth of our industrial technological society and its subset of related issues, such as population growth, food production, environmental quality, waste accumulations, health hazards, personal and national security, standard of living, and equity, to cite a few. Solutions to what is commonly referred to as our "energy crisis" are not to be found in science and technology alone. Social factors such as distribution, accessibility, costs, and scarcity surrounding the consumption of certain categories of energy sources, namely nonrenewable fossil fuels, must enter into each and every potential remedy. Hence, the energy question is complex and elusive and solutions can often be unacceptable to many people.

The question "How should students become knowledgeable about energy issues?" is difficult for educators to respond to adequately. Perhaps it will be easier to focus on what are considered the desired goals of energy education. In general, we can say that educators desire to develop awareness, knowledge, and concern among our future citizenry in order that they can become more effective decision makers when confronted with future energy choices and making equitable decisions from among those choices.

The energy "crisis" of 1973-74 sparked the growing energy concern among educators and as a result a number of energy curriculum materials have been produced, namely in the areas of conservation, consumption, technology, production, current energy sources and alternative sources. Our aim is not to duplicate what is presently available but to complement existing material and lead students in the exploration of some of the current and future energy issues and choices to be made.

We contend that energy decisions and choices, now and in the future are deeply rooted in personal moral judgments reflecting values, preferences and priorities. Since we live in a world of increasing international and interpersonal dependency, our decisions have far-reaching social, political, economical impacts and consequences. Our decisions thus affect not only our own lives and livelihood but those of others.

Primitive agricultural people's energy concerns involved the use of a few basic hand tools, supplementing their own power with animal power and gathering firewood. When their basic fuel source, wood, became meager, they merely moved onto new forests. In today's world we have unleashed new energy sources to help us move mountains, change rivers and create new ones, and grow abundant harvests. Machines have brought us undreamed of powers and literally replaced the need for human labor. As a result, decisions regarding energy sources we use and how we use them are not limited to insignificant, isolated consequences. The burning of coal can blanket the sky with black soot, produce chemicals that contribute to lung diseases, and change weather conditions. The automobile and airplane affording us a new mobility and a different way of life, are rapidly depleting a more limited fuel source—oil—the product which has taken nature millions of years to create. In addition, auto exhaust gases and other products pollute the air in some urban centers to such an extent that gas masks are periodically recommended for the residents. Our most recent fuel discovery, nuclear power, poses potential health and environmental hazards to future generations, thousands of years hence. Yet, we grow more dependent on greater energy consumption to maintain our life-style of home and work comforts. However, we no longer have the luxury of earlier people to simply "pull up stakes" and move on to new virgin lands when a fuel supply has been depleted. Moreover, our energy requirements depend on a complex structure of support systems: mining or drilling operations in distant places, transportation, refinement and conversion, to final delivery in a usable form. Since our primary fuel sources today are finite in quantity they all have an associated cost. In our choices and decisions we have to consider the idea of "trade-offs"—what are we willing to accept and what are we willing to give up? If we consume more than our share, what effect does it have on others?

The many aspects of energy production and consumption therefore pose moral and ethical considerations at every level. Let us take, for example, the government's recommendation that we turn to coal to supply more of our electrical needs because our coal resources are more abundant. This would reduce our dependency on foreign oil and the continued drain on our economy. To adopt this course of action will create some new dilemmas. "Can the stripmined lands ever be restored to their original state? What lands are we going to commit to the ravages of mining? Should the residents be forced to move off the land? Should air quality standards be lowered to accommodate the burning of coal? Should more workers be subjected to the hazards of mining, and how can they be adequately compensated if they contract "miner's black lung"?

There are no simple answers to these questions. Although science and technology can provide the knowledge and tools to answer the questions of what is technically possible, the question of what actions *should* be taken are once more values questions. "If we wish to preserve the delicate natural balance of the plains under which are vast reserves of coal, are we willing to reduce our life-style of comforts dependent on electricity?"

Insight into our value and ethical system may guide us in seeking answers to these questions. It is also our belief that effective values analysis activities in the classroom will help prepare students to become informed and participatory citizenry, an important educational goal. The module *Energy:*

Decisions for Today and Tomorrow will address this goal as well as help our students become aware of energy issues in a broader context, the prerequisite for effective energy decision-makers.

This module obviously does not address the full spectrum of energy related issues and topics facing society. It was our judgment that by limiting the scope of issues covered and examining those issues from several perspectives and degrees of concern, a more effective and interesting module would be produced. The energy issues included in this module were not, however, selected randomly. Rather, they were decided upon only after careful consideration of a variety of factors. The three sections deal with the following issues.

"*Miles to Go—But How?*" This section addresses energy and transportation problems. Of the many energy issues, this one probably affects the students and their families most directly. It is also an issue that they as individuals can do most about. Attacking this issue might also involve some of the most drastic changes in life-styles (especially for middle class suburbanites).

"*The Nuclear Power Controversy*" This issue is probably the most controversial of all energy related issues and, unfortunately, the one that is least understood by society. Both "sides"—pro and con—present convincing evidence to support their positions. Both "sides" exhibit imposing lists of nuclear "experts" who agree with them. How is the student and citizen going to decide who is "right"? Is any one of them right?

"*New Showdown in the Southwest*" was selected for two reasons. First, it exemplifies the broad spectrum of problems and concerns all interacting at the same time—associated with most energy issues (scientific, technological, social, political, economic), and the heated values conflicts that surface when energy options are explored. A second major reason for selecting this coal-related issue includes the new emphasis and reliance being placed upon coal to "solve" our energy dilemma. While coal is certainly the most abundant of all fossil fuels, increased and extensive use of this fuel presents many other serious environmental problems. Hence, while coal offers a good "way out" of the energy shortage, environmental quality and human health might suffer.

Overview of ENERGY: Decisions for Today and Tomorrow

Purpose

The purpose of this module is to engage students in the examination of some of the issues that underlie our "energy crisis" and the consideration of value aspects involved in decisions regarding energy consumption, distribution, sources, etc. By posing dilemmas of current as well as future concern, students should gain an increased awareness of the vital role of energy in their lives and an understanding of how different decisions will affect the very course of human society. Through critical analysis of the issues and consideration of possible consequences it is hoped that students will become more effective decision makers who assume a broader perspective and scrutinize effects beyond their own lives.

Strategy

It is our belief that an understanding of problems/issues and taking a stand necessitates a knowledge base and a sense of personal involvement. The knowledge base in the materials is provided through short readings in the form of articles or scripts (which students can act out), worksheets, and guiding questions. Opposing sides of issues are included in order that students can begin to reflect on and question the wisdom of a given choice or decision. The readings in script form are in essence composites of ongoing debates found in the current literature.

The dilemma situations are used to focus on and heighten issues to more personally involve students and demonstrate the relevancy to their lives. Many of the dilemma situations are adapted from actual case histories while others, although hypothetical, reflect critical choices that are being made today or will need resolution in the near future.

The dilemma debate/discussion will be the focal point of the classroom activity and student interaction. This approach provides an opportunity for students to role take and in this manner experience value or ethical conflict. Taking a position and defending it requires direct involvement on the part of the student. Hearing arguments and opinions of others will help lead them to the examination of implication and consequences of their particular stance. For the student the level of relevancy becomes elevated, and he/she can begin to understand the dynamic interrelationships of energy issues and the complexity and difficulty of decision-making surrounding our "energy options."

Structure of the Dilemmas

The dilemmas are essentially brief stories that pose a critical decision to be made by the central character(s). They are heightened in such a way as to stimulate students to express their opinions and partake in the dialogue. The basic format developed by Kohlberg is extended to include additional background information surrounding the dilemma and special focus on one or more issues identified in the readings. The choice to be made revolves around the moral/ethical issues of the situation, and it is the moral/ethical implication that provides the thrust for the discussion.

Although the dilemmas involve individuals, we have constructed the different dilemmas to reflect decisions having effects at the personal, community, national and international levels. Hence, students can begin to expand their scope and consider impacts from a variety of perspectives. However, in view of Piaget's model of intellectual development that places seventh and eighth grade students at the stage of transition from concrete operational thinkers to formal logical thinkers, several dilemmas in this module are directed at the more personal level of social interaction. This is intended to bring energy issues into closer proximity with the students' own lives and concerns, and in a sense make problematic situations more "real" from their perspective.

The dilemmas as presented are simple in form but can be further developed by the teacher with increasing complexity, depending on the intellectual and conceptual level of the students as well as their interest and curiosity. The subject area or course in which this module is taught will determine ways in which many of the concepts might be further developed—such as concepts from sociology, economics, ecology, government, philosophy history, etc. Drawing relationships from what is learned in the course will inevitably make students' learning more meaningful and applicable.

ENERGY: Decisions for Today and Tomorrow in the School Curriculum

This module, designed for the middle grades (7-8), may be used in a number of subject areas: social studies, science, language arts, etc. In a social studies class questions about the social cost of nonrenewable resource depletion might be explored in greater depth, while in a science class the environmental risks and effects might be pursued. In the English class emphasis might be placed on the analysis of arguments, persuasive techniques, or public speaking and role playing.

The dilemmas can also serve as a "springboard" for teachers to develop additional dilemmas for their classes. So often it is the case that many of the best dilemmas are developed spontaneously from the materials that are part of the ongoing coursework. Having used these dilemmas, teachers can better understand the intent and value of dilemma discussions and to recognize other problematic situations that confront society. Meaning and relevance can be bridged when specific information is related to its impact on our lives and the more global effects on the future of the human race.

All important in this strategy is to engage students in the consideration of problems and new concerns that arise from society's use of energy. How to best insure the very existence of human society requires great wisdom which educators can nurture and develop in the classroom.

Objectives of the Module

- To increase student knowledge on energy-related issues.
- To increase student ability to analyze energy-related issues.
- To increase the socio/scientific reasoning ability of students.

- To increase student's decision making skills by considering a range of alternative solutions.
- To increase student's awareness of conflicts of interests that contribute to the "energy crisis."
- To increase student's understanding that energy issues are intimately related to social, economic, political, cultural and environmental issues and activities.
- To help students recognize their role and involvement in energy-related issues.
- To enable students to effectively integrate technical information into decision making.
- To increase student's ability to recognize potential effects of different types of decisions on energy-related issues.
- To increase student's ability to develop and present effective arguments in a logical, comprehensive manner
- To enable students to more critically examine their value systems.
- To increase student self-esteem and ability to communicate and function more effectively in classroom discussions.

Components of ENERGY: Decisions for Today and Tomorrow

- Student's Guide
- Teacher's Guide
- Student Handouts

ENERGY. Decisions for Today and Tomorrow is comprised of three parts, each focusing on a current, major source of fuel energy and its related issues: Part I, Oil and Transportation; Part II, Nuclear Energy; and Part III, Coal. To demonstrate some of the many aspects of the subject, the dilemmas or role play situations highlight the effects and problems posed by increased consumption of these fuels. Accompanying each dilemma are relevant readings and/or student activities to provide a brief information base and create problem awareness. In addition, for each dilemma included in the module, there is a listing of probe questions which students should consider in determining why a central character in the dilemma should take a particular action. The questions also serve to help encourage discussion by bringing out additional aspects of the moral issue.

TABLE 4

Issues Employed in Each Dilemma

Dilemma	Issue*								
	punishment, blame	property	affiliation role	law	life	truth	governance	civil rights, social justice	morality/mores
PART I "Miles to Go—But How?"									
Dilemma 1 Who Has Oil to Sell?		X					X	X	
2 One Good (or Bad) Turn Deserves Another	X	X		X					
3 "Do Unto Others"		X	X	X					
4 Ted's Dilemma		X			X				X
PART II The Nuclear Power Controversy									
Dilemma 1 Governor Curtis' Dilemma				X			X	X	
2 Mr Frank's Dilemma— "To Sell or Not To Sell"		X	X		X				
3 "Is the Water Hot?"					X				
4 Who Can Be Blamed?	X				X		X		
PART III: New Showdown in the Southwest									
Dilemma 1 Even the Rain	X				X			X	
2 The People of Jolla		X					X	X	

*These basic moral issues as identified by Kohlberg comprise the underlying elements of a conflict situation involving a moral decision. Our dilemmas were constructed to incorporate two or more of these issues. Dilemma resolution requires a choice of action to be made between conflicting issues. For instance, in a dilemma dealing with the issue of governance and social justice, the questions surrounding the issue of governance include 1) Should one accept or reject the authority of the governing body? 2) What are the characteristics and responsibilities of good government? The social justice issue raises the questions. 1) Should one defend or violate the political, social and economic rights of another person? 2) What are the bases of these rights?

Each of the energy dilemma stories presented in this module concentrates on two or more basic values issues. Table 4 identifies the issues emphasized in each of the dilemmas.

Again, the dual purpose of the module is to confront moral dilemmas and to gain insight into our energy concerns—both of which are necessary for effective decision making and problem solving now and in the future.

The three sections are designed with flexibility in mind. They may be presented in the order given and as a single unit of study or in an order that would best relate to ongoing classroom studies. The dilemma discussions may follow directly one after another or with time intervals between each dilemma. However, it is recommended that the dilemmas within a section be discussed as ordered. If there is insufficient time to discuss all dilemmas, it is best to eliminate the remaining dilemmas within a section. The module is intended to provide another dimension to the existing course or "stand on its own" as a mini-course.

The student materials provide the following structure for classroom discussion activity:

- Introduction
  reading
  and/or student exercises
- Presentation of Dilemmas
- Discussion of Dilemmas
  small group
  entire class

Or, in the case of the role play activity,

- Introduction and role assignments
- Development of role character and preparation of presentation
- Enact role situation
- Vote on proposal
- Class discussion and debriefing

A Brief Summary of Each Section

Part I: ". . . Miles to Go—But How?"

The introductory graphing and graph interpretation should convey to the student some general notions about energy sources and changes in our energy usage patterns since the industrial revolution. These are followed by a series of five (5) dilemmas that have bearing on issues related to petroleum and transportation. Transportation, as it relates to our needs and life-style, is examined from a personal, community and international perspective through these dilemmas.

Part II: "The Nuclear Power Controversy"

Issues of the nuclear controversy are brought out in readings in the form of dramatic dialogue. Student activities include a class simulation of a town meeting to decide on whether or not to permit construction of a nuclear power plant and discussion of four dilemmas that point out current and potential concerns arising from increased nuclear power production.

Part III: "Shoot-Out at Four Corners"

The reading is a case study of the Four Corners' question and provides the background information for discussion of the issues related to coal mining and power generation. An exercise in determining a family's electrical budget and two dilemmas raise questions regarding our increasing consumption of electric power and resultant environmental deterioration. The major activity of this section is a simulated hearing where students role play the public reaction to development of coal powered generating stations in the North Central Plains.

Teaching Strategies and Student Activities

Part I—". . . Miles to Go—But How?"

• *Reading 1: Introduction*

This short reading introduces the students to *Energy: Decisions for Today and Tomorrow* and raises some of the questions and issues that will be dealt with in the subsequent activities.

Student Activity After students have read the introduction you may wish to have them express some of their thoughts about energy and how they use energy in their various activities in a short class discussion.

Some questions for consideration might include.

- Have "energy crises" ever occurred in past history?
- What is a nonrenewable resource?
- Why is energy a topic of such great concern today?
- What are some of the ways we use energy in our daily activities?

• *Student Activity 1: How Have Our Energy Needs and Uses Changed?*

Student Activities: Students will graph the data found in *Table 1. U.S. Energy Consumption Patterns, 1850-1979* (Page 1 Student Guide) onto Graph 1 (Handout #1). The completed student graphs should resemble the sample graph on page 20 in this Teacher's Guide.

Questions that follow may be assigned as a written exercise or discussed in class in conjunction with examination of students' completed graphs.

Comments and Suggestions: During discussion of the completed graph, ask students to project into the future and try to forecast what the consumption pattern might be 10 years hence 25 years, 100 years On what do the base their forecast?

• *Student Activity 2: How Do We Use Our Energy?*

Student Activities: Students will study Graph 2. *U.S. Gross Energy End Uses, 1973* and answer the questions either as a written assignment or in a class discussion.

Comments and Suggestions. This exercise is intended to convey a notion of how energy is used in the United States. Depending on the interest of your students, the class may wish to examine the more technical aspects of energy conversion or industrial processes that require large amounts of energy. A list of topics may be developed from class discussion to suggest possible areas for individual research activities.

• *Student Activity 3: World Energy Uses*

Student Activities:

- Using the data found in Graph 2 *World Energy Consumption by Source, 1960-1975*, students will complete Table 2. *Changes in World Fuel Sources* (Handout #2). Information needed to complete the last two columns is found in Table 1, page 1.
- The second part of this exercise requires students to examine Graph 3: *World Energy Consumption by Region, 1960-1975* and answer the questions that follow. Again, the questions may be answered in written form or orally.

Comments and Suggestions: After completing the two exercises in this activity it should become very evident to the students that the U.S. uses a large, disproportionate share of world energy resources. Although the facts of dwindling oil reserves have not been examined here, it may be useful to pose this problem somewhere in the class discussion. Also introduce the idea of our increasing dependence on imported oil our increasing consumption rates, and our resultant trade deficit These issues will be examined in the following dilemmas and some awareness of the problem will enhance the relevance of the discussion.

• *Student Activity 4: Dilemma-Discussion*

Follow the basic procedure for conducting dilemma discussions as suggested previously.

Dilemma 1—"Who Has Oil to Sell?" The pricing of middle eastern oil is of a continual U.S. concern, and its political aspect is well illustrated during the 1973-74 embargo. This dilemma raises the question of a property holder's right to select his/her customers from the viewpoint of international relationships and equity.

Dilemma 2—"One Good (or Bad) Turn Deserves Another" This dilemma is an extension of the previous one and entertains the idea of the legitimacy of pressuring with military force. As abhorrent as this thought is to most rational people, it is by no means a farfetched notion in the interplay of world politics.

Dilemma 3—"Do Unto Others . . ." The effects of a gasoline shortage is brought back down to a personal level, and illustrates our dependence on private automobile travel.

Dilemma 4—"Ted's Dilemma" This dilemma also focuses on a personal conflict and the priority of personal values and desires. Both Dilemma 3 and this one points out life-style changes and personal sacrifices associated with the allocation of a scarce resource.

Since Dilemmas 3 and 4 revolve around different aspects of life-style changes when mobility in auto travel is curtailed, you may wish to use only one or the other dilemma if time is a limiting factor. Also, the effectiveness of dilemma discussion is a function of student interest in the issues, and, therefore, for different student classes some dilemmas may be more appropriate than others. Your experience should be your best guide.

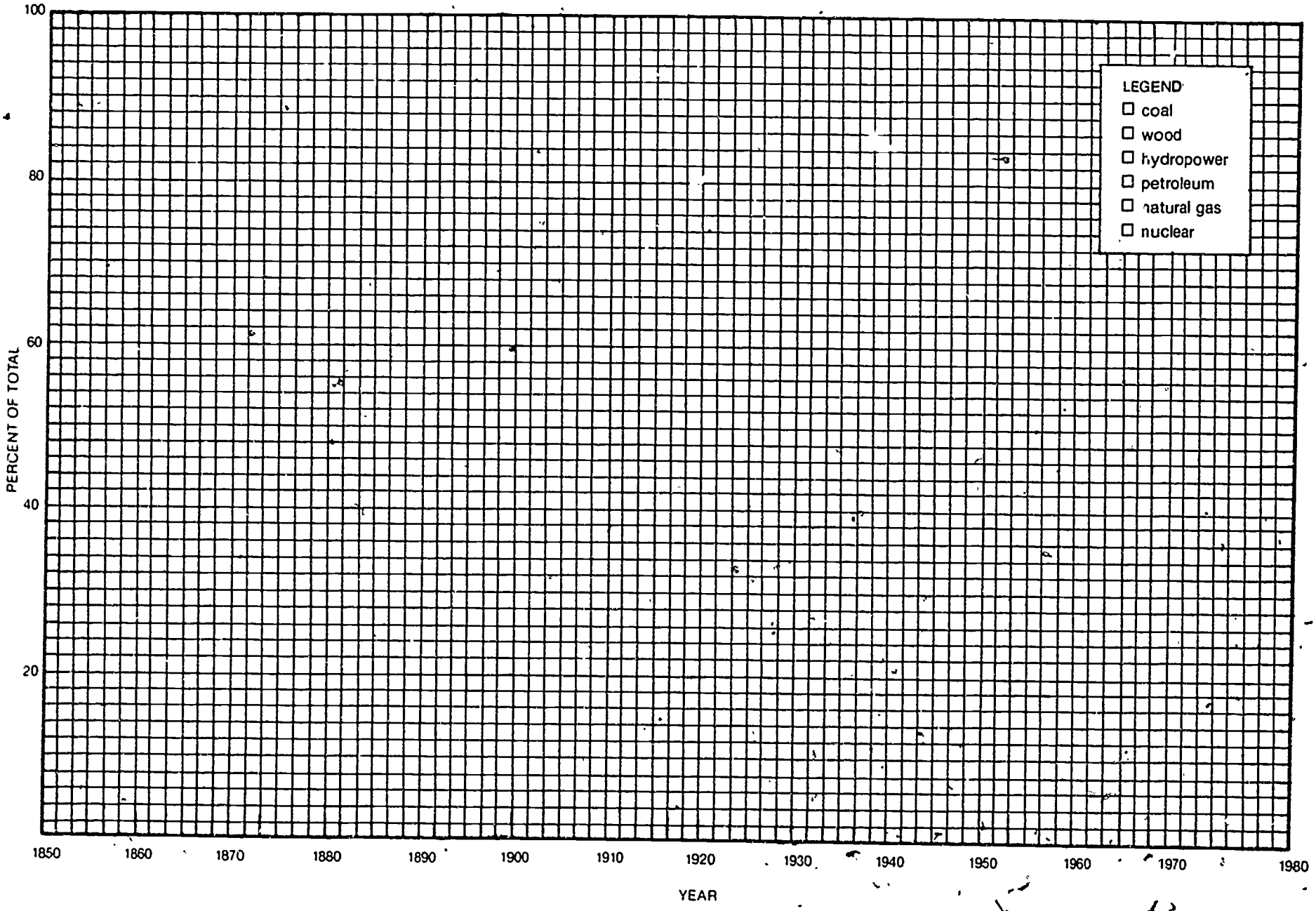
• *Student Activity 5: A Topic for Debate—The Mayfair Project*

The question of community priorities is the topic for this student debate. The town of Mayfair has planned to build a community center, but given the problem of fuel shortages, a proposal to develop a mass transportation system is presented to the Mayfair town officials.

In debating the question, Community Center vs. Mass Transit System, you or the class may select one of the two debate formats suggested. The debate format you select to employ is essentially based upon the amount of time you want to devote to this activity and the skills you desire the students to exercise.

U.S. ENERGY CONSUMPTION PATTERNS, 1850 - 1979

HANDOUT ONE



Activities: Conducting the Debate

• Debate format #1. This debate format follows the traditional style of a formal debate.

1. Two teams of 4 to 6 students are selected, one team arguing for the community center, the other arguing for a mass transit system.

2. The remaining members of the class will serve as judges to select the winning team. They will construct a chart based on the example given on page 9 to score each debater. Points ranging from 1 to 5 will be awarded to each debater for each of the following categories:

Style of presentation
Organization of argument
Use of information
Strength of argument

Instructions/suggestions for scoring each category are included in the student's manual.

Each judge will complete a separate score sheet and will submit his/her final team score to the class recorder who will compute the total score for each team. The team receiving the highest scores is declared the winner.

3 Prior to the debate the class should determine the length of time to be allotted for each debater and the length of time for rebuttal. The class may also elect to open a question period for the judges. A moderator should be selected to conduct the debate and serve as time keeper.

4. The debate teams should be given some time to organize their ideas, assign the issue that each debater will focus upon, and prepare the arguments. At this time debaters should review the criteria on which they will be judged. Also, the questions found on page 1 should assist the debaters in the development of their arguments.

• Debate format #2. This debate format is based upon the idea of a "brain storming" session. It serves as a method for generating a wide range of alternative ideas and requires students to think quickly and creatively. Rapid, spontaneous responses are the objectives of this format. It provides a change from the more structured types of presentation and can produce some very dynamic class interactions.

1. Have the students randomly form two teams of equal size. Each team is then assigned to support the community center or mass transit system. The two teams will seat facing one another.

2. Make sure that the students have read the problem, and then begin directly with the debate.

3. Each team member will be given 30 seconds or one minute to present his/her argument. The teams will alternate in the presentation of the argument until all members have had an opportunity to speak.

4. Upon completion of the presentation you may wish to have the teams switch and take the opposite position. The debate will proceed as before, except the students will now represent the opposing side.

5. After all arguments have been presented, the class may then reconvene as an entire group to discuss the major points that were brought out and the best arguments. At this time the class may wish to take a vote on the proposal to adopt.

Comments and Suggestions: The debate format #1 offers students an opportunity to practice their public speaking skills as well as to develop a logical persuasive argument. On the other hand, format #2 encourages spontaneity in thinking, learning to present impromptu speeches and careful listening.

TABLE 2

HANDOUT TWO

Changes in World Fuel Sources

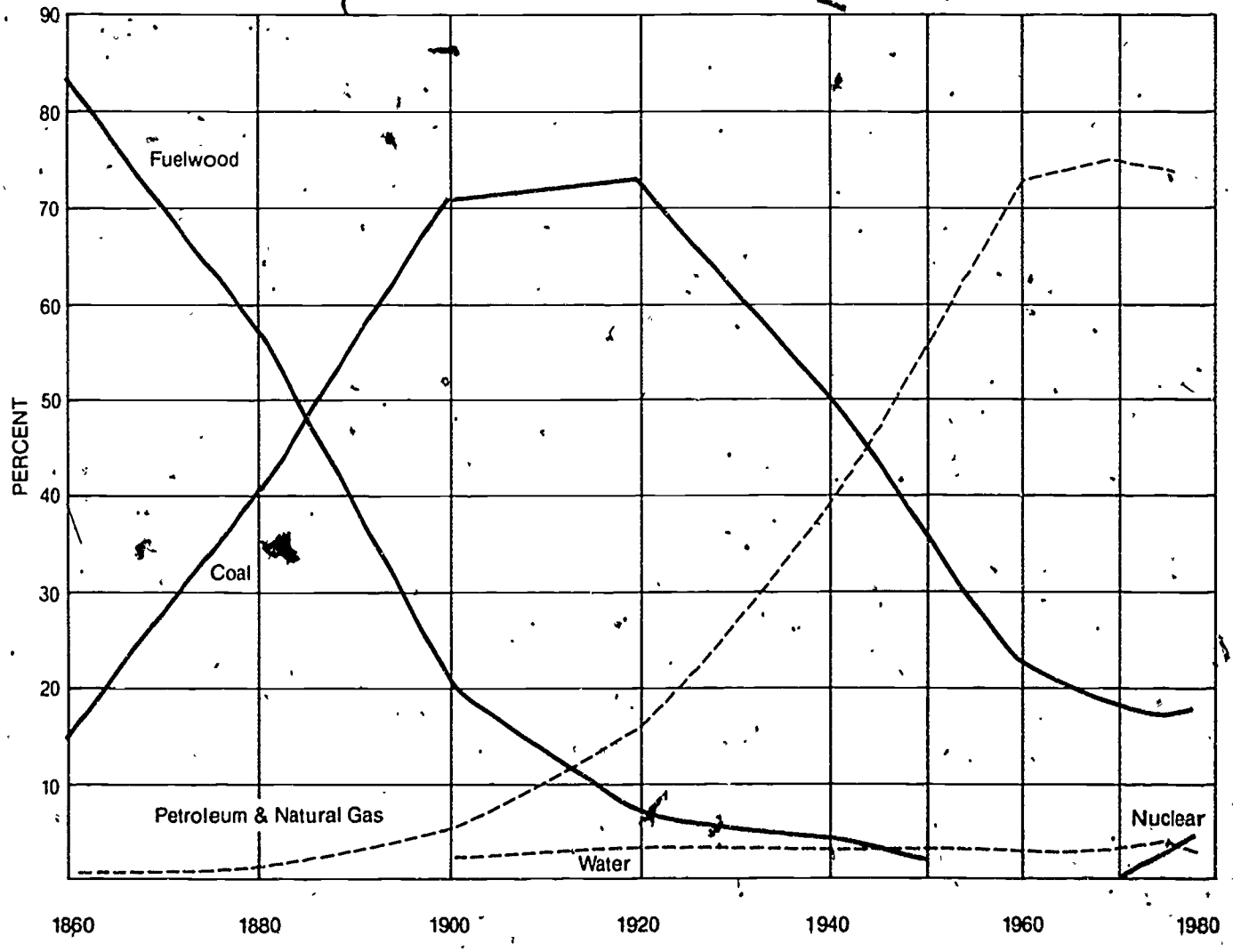
(percent)

	WORLD			UNITED STATES	
	1960	1975	Change	1975	U.S. Compared to the World
Coal					
Petroleum					
Natural Gas					
Hydropower					
Nuclear					

1. From graph #2 find out how much of the total world fuel is supplied by each of the five major fuel sources in 1960 and 1975. Enter the percentage figure in the appropriate space in the table.
2. Under the "change" column indicate which of the fuel sources have increased (↑) and which have decreased (↓) in terms of the total consumed. (NOTE: since we are comparing the percentage of each to the total we find that coal's share of the total fuel consumed has decreased. However, the actual amount of coal consumed has increased. It has not increased to the same extent as other fuel sources.)
3. To complete the column "U.S. - 1975" use data from Table 1 on page 1.
4. Compare the extent the U.S. uses each fuel to that of the rest of the world. Is the fuel used to a "greater" or "lesser" extent in the U.S.? Indicate this under the column "U.S. Compared to the World".

SAMPLE GRAPH

U.S. ENERGY CONSUMPTION PATTERNS, 1850 - 1979



Data from, *Energy in Focus. Basic Data.* (Washington, DC, Federal Energy Administration) 1977, *Monthly Energy Review.* (Washington, DC, Department of Energy) 1978.

Fuel wood, which constituted 90.7 percent of U.S. energy sources in 1850, became a negligible energy source by 1960. As a percentage of total energy input, coal consumption reached its historical peak in 1910. Between 1900 and 1974, petroleum increased its share of total energy consumption from 2.4 percent to 46.2 percent, natural gas increased its share from 2.6 percent to 30.2 percent, and coal's share of total energy input declined from 71.3 percent to 17.2 percent.

Part II-"The Nuclear Power Controversy"

SECTION A

• Student Activity 1: The Beekertown Vote

Students will assume the role of Beekertown residents and come to a decision about whether or not to permit the construction of a nuclear power plant in their area. The issues and arguments are presented in the format of a written transcript of a town meeting.

Activities

• Students will read Reading 1: *A Transcript from Lakeview Town Meeting* to gain an awareness of the issues that arise in a power plant siting proposal.

Alternatively, the script can be presented as a dramatization with students enacting the various roles.

• The class will form small discussion groups to discuss and evaluate the different arguments presented. Distribute to each student a copy of Worksheet #1 (Handout #3) *Identifying the Main Argument Presented at the Lakeview Town Meeting.* This will assist students in prioritizing the arguments they have identified.

• The class will then meet in its entirety to hear the major reasons selected and decision of each group. The presentations should be about five minutes in length.

• Each student will then cast his/her vote on the proposal. This should be a secret ballot in order that students need not feel pressured by other class members.

• The questions at the end of this activity may be used when results of the vote are discussed.

Comments and Suggestions: Although this is a role play simulation, the same types of issues are present here as in the dilemma stories. Through the use of your own probe questions engage the students to address these issues during the small group meetings.

Since the arguments and issues are presented in a very abbreviated form students may wish to do some additional research before meeting in their small groups.

• Reading 2: An Unexpected Dilemma for Lakeview

This reading provides the background information for Dilemma 1, *Governor Curtis' Dilemma,* and should be assigned prior to class discussion of the dilemma. If you so desire, the script may be acted out by members of the class. Some classes have videotaped this simulation and presented the situation in the form of a newscast.

• Student Activity 2—Dilemma Discussions

Follow the basic procedure for conducting dilemma discussions as suggested previously.

SECTION B

Dilemma 1: Governor Curtis' Dilemma

The question of nuclear fuel transportation and safety is heightened in a conflict situation involving a public protest. Issues about the legitimacy and responsibility in public protest might be further discussed.

• Reading 3: Disposal at Eggertown

The problems associated with nuclear fuel reprocessing and permanent waste disposal are outlined in this reading and serve as the information base for completing the worksheet and discussion of the next dilemma. Again, this may be read individually or presented in a dramatized form.

• Student Activity 3: Dilemma Discussions

Dilemma 2: Mr. Frank's Dilemma "To Sell or Not to Sell"

Although personal considerations enter into the decision regarding the site proposal for nuclear waste reprocessing and disposal, students should also take into account the broader ramifications of the issue.

Worksheet #2—Effects of a Diversified Fuel Management Center

To assist students in directing their attention to the broader issues they will first complete worksheet #2 Handout #4 during their small group meeting.

• On the worksheets they will first decide whether they will be examining the effects from the viewpoint of Eggertown or the rest of the country.

• From Reading 3, their own knowledge, or other sources they will identify and list the effects from the viewpoint of Eggertown or the rest of the country. These effects will be categorized as either "long" term or "short" term.

• For each effect the advantages and the disadvantages are to be cited.

• Students will then determine whether they feel the advantages outweigh the disadvantages or vice versa.

Having organized their thoughts and information in this manner they will proceed to discuss the dilemma using the procedure previously discussed in this Teacher's Guide.

It is hoped that in the discussion of Mr. Frank's dilemma many of the arguments and reasons will draw upon the more global considerations.

• Reading 4: A Scenario in Outline Form—The Radioactive Waste Storage Situation

Some of the current concerns about the accumulation of radioactive waste and its ultimate disposal are briefly outlined. This information will provide some ideas that should be kept in mind in the discussion of the two dilemmas which follow.

• Student Activity 4: Dilemma Discussion

The same procedures for conducting dilemma discussions also apply here.

Dilemma 3: Is the Water "Hot"? Although aspects of this dilemma center on the obligation of friendship, the ideas of public reaction to nuclear power, safety precautions, storage problems, etc. should be brought out. In science classes it might be pertinent to discuss some of the biological effects of radiation.

Dilemma 4: Who Can Be Blamed? This is the sequel to the preceding dilemma and further extends the idea of responsibility on the part of all citizens in terms of vigilance and agencies in terms of carrying out their charges. These two dilemmas can be related to the recent news disclosure of military personnel exposed to radioactivity at a nuclear test site and their subsequent development of leukemia.

Note that some suggestions for alternative dilemmas are included here.

Worksheet #1: Identifying the Main Argument Presented at the Lakeview Town Meeting

1. In a summary form list the arguments "for" and "against" allowing the nuclear generating plant to be built in the area (e.g., FOR—need for electricity; AGAINST—change natural environment)
2. According to your opinion, how important is each reason? Indicate the level of importance with a number from 1 to 4 in the "importance" column.

4 - most important
3 - much importance
2 - some importance
1 - no importance

FOR	Import-ance	AGAINST	Import-ance

Worksheet #2 *Effects of a Diversified Fuel Management Center*

Complete this worksheet to help you in the discussion of Mr. Frank's dilemma: "To Sell or Not to Sell"

1. From the Eggertown testimonies determine how Eggertown or the rest of the country might be affected. Indicate whether you are examining the effects from the viewpoint of Eggertown or the rest of the country by checking the appropriate space.
2. List the effects under the short-term or long-term category. Explain the advantages and disadvantages of each effect.
3. Do you think that the advantages from that effect outweigh the disadvantages? Place a (+) in the last column. Do you think that the disadvantages outweigh the advantages? Place a (-) in the last column.

On Eggertown_____ On rest of country_____

short-term effects (for next few years)	advantages	disadvantages	(+) or (-)
1.			
2.			
3.			
long-term effects (for distant future)	**advantages**	**disadvantages**	**(+) or (-)**
1.			
2.			
3.			

Comments and Suggestions. After completing the activities of Part II it might be interesting to "retake" the "Beekertown Vote". If the results of the vote are different, discuss with the students why the changes occurred. What were some of the new considerations?

Part III-"New Showdown in the Southwest"

SECTION A

• Reading 1: "The Shootout at Four Corners"

Have students read this short section to gain a sense of our increasing demands for electricity. Although Los Angeles was the example illustrated, it is by no means unique, and reflects growth and development throughout the United States. In class discussion you may wish to examine and contrast the growth in your own area.

• Student Activity 1: A Cast of Consumption (page 22)

Activities:

• Have the students find out approximately how much electricity they use in their homes annually by consulting the chart, Electrical Consumption for Some Common Home Appliances on page 23 of the Student's Manual. They will identify their home appliances and add up the kilowatts their house uses annually.

• The students are then asked to reduce their consumption by 25% by proposing their personal conservation plan. Distribute Worksheet #3 (Handout 5) *Reducing Your Use of Electricity*, on which they will make their calculations and explain how they plan to make the necessary savings.

• A comparison of our present consumption of electricity with consumption in the past will be made. Students will ask their grandparents or an older person what appliances were available when they were young. With that information the students will determine the rate of increase since that time.

Comments and Suggestions:

• Students may need a brief explanation on how electric power is measured, and definitions for the following terms:

watt: a metric unit of power usually used in electric measurements which gives the rate at which work is done or energy is expended. 1 watt = 1 joule/sec.

kilowatt: 1000 watts

kilowatt hour: the expenditure of one kilowatt of energy in one hour

• Have them examine some common electrical appliances for the watt usage.

• Students may wish to find out how much electricity is used daily in their homes by taking several 24 hour readings of their electric meter. Explain how electric meters are read.

SECTION B

• Student Activity 2: Changes at the Four Corners

Student Activities:

• Students will read Section B of "Shootout at Four Corners", pages 24 to 26. This reading describes for the students the Los Angeles solution for meeting its electrical energy needs and the ensuing problems and controversies that erupted.

• Since a number of important major concepts are presented here, it may be advisable to have these various concepts and technical information briefly summarized by the students. To accomplish this have each student (or small groups of students) take the perspective of one of the following people: (Add additional roles as necessary)

Los Angeles Area

1. suburban resident, 2. real estate developer, 3. appliance salesman, 4. construction worker, 5. banker, 6. teacher.

Black Mesa Area

1. Navajo Indian, farmer, 2. shopkeeper, 3. miner, 4. electric plant manager, 5 park warden, 6 rancher, 7. doctor (general practitioner).

Phoenix, Arizona Area

1. manager of industrial plant, 2. home builder, 3. restaurant owner, 4. engineer, 5. junior high school student, 6. university astronomer

Students should be able to infer from the reading a number of different changes brought about by the massive power generating complex at the Four Corners. Have them describe in a short statement how their lives (if they were that person) have been affected or changed as the result of that development. (i.e.)

How have they benefited from the availability of inexpensive electricity?

Or, in the case of those living near the plants—How has the area around them changed?

Are there now a greater number of jobs?

Would cities such as Phoenix have grown to the same extent without readily available electrical power?

What environmental changes do they now see?

Have they had to change the way they lived?

• Student Activity 3: Dilemma Discussion

Follow the basic procedures previously outlined for dilemma discussions.

Dilemma 1: "Even the rain . . ." An example of air quality deterioration is dramatically illustrated when an archeological monument and human health are threatened. Hence the value conflicts between life-style needs, health and historical landmarks are in the arena together.

Comments and Suggestions: The information from the reading and preceding activity should help focus the issues that students will discuss.

It may be of assistance to the students when they meet in their small groups to organize their ideas in the following way:

- Indicate those *issues* that influenced their discisions
- For each issue identify the relevant *data/information*
- Develop the *reasons* or arguments based on the information
- Organize their reasons in the *order of importance*.

SECTION C

- **Student Activity 4: A Question of Water**

Student Activities: Students will read Section C of "Shootout at Four Corners", pages 28 to 29. This reading brings out two issues related to the production of electricity from coal. The use of water for cooling the power plants as well as transporting the coal becomes a major concern in arid areas. This is further compounded by the question of whether or not reclamation intentions will be carried through and the success of such efforts.

- **Student Activity 5: Dilemma Discussion**

Follow the basic procedures previously outlined for dilemma discussions.

Dilemma 2. The People of Jolla. Providing power to distant areas involves many types of changes for those living on the coal rich lands , life-style as well as environmental. In the question posed by this dilemma the value of water to the local resident is addressed.

SECTION D

- **Student Activity 6:**

Student Activities: Students will read Section D, the final section of "The Shootout at Four Corners", pages 30-32.

This last section further explores the question of priorities, conflicts and the responsibility of those in a decision-making position.

Comments and Suggestions: After the students have completed reading this final section, a review of the main points may help unravel the complexities of the situation and point out the difficulties in resolving the many areas of conflict. Understanding the roles and responsibilities of the different government agencies may be of additional assistance to students in developing an awareness of multiple concerns at both national and local levels.

Since the entirety of the reading "The Shootout at Four Corners" will serve as resource data for the next activity, it is important that the students have a grasp of the major concepts and the terminology used. Your own judgment is your best guide as to what should be expanded or clarified in class review of this reading.

- **Student Activity 7: "Cowboys and Indians"**, a role playing exercise. Pages 32 to 34.

Student Activities:

- Students will conduct a hearing on the question of power development in the North Central Plains, a situation with problems similar to those at the Four Corners.
- Have students select or assign the roles to be portrayed. The directions for developing the role characterizations are detailed in the student's guide. Allow at least one class period for the students to review the information, do additional research and prepare their presentation. A procedure for developing their role presentation is shown on "Sample Worksheet for Witnesses", p. 36.
- Prior to the hearings the two publicity agencies will present their campaign in the various forms of ads or commercials. Guidelines and time allotment should be determined for this activity. (i.e. when this should take place and the length of each group presentation).
- Conducting the Hearing (approximately 2 class periods)

A chairperson elected from among the Senators will preside over the hearing.

It is suggested that the classroom be arranged to simulate a hearing room with the Senators seated together. Name plates should be made to identify the name and state of each Senator.

The Senators should prepare worksheets resembling the sample shown on page 35 to take notes on the testimony and record their reaction.

When all the testimonies have been heard each Senator will cast his/her vote publicly and explain how he/she came to this decision. Another vote may be taken if there is no majority opinion on the first round. Before the second round of votes is cast, each witness may make a summary statement or restate his/her main agreement. If on the second round no "side" gains a majority of the votes, rather than belaboring the controversy, it would be advisable to proceed directly to the debriefing session and discuss the problems that make agreement on an acceptable choice difficult.

- *Debriefing the Simulation* The debriefing session is an important and essential component of any simulation. Allow sufficient time for this activity. This should be the opportunity for summarizing what occurred and analyzing the experiences and feelings expressed.

Debriefing sessions are by nature open-ended and the discussion should be consistent with the needs and interests of your students. (Since the students were bound to some extent by the roles they portrayed, this debriefing may give them a chance to express their own feelings on the issues. In general the discussions proceed from specifics about the simulation to generalizations about the real world.)

You may wish to consider some of the following areas to explore at the debriefing. (These are only a few of the possible considerations and the order of treatment is unimportant.)

Use of data and information—How were different types of data used in persuasion? Were same data used in different ways by two sides?

Portrayal of roles—Were some roles more difficult than others to portray? Why? Did the students feel comfortable in their roles?

Types of arguments—On what issues was it easiest to develop good arguments? What were more difficult? Why? What types of argument were most effective?

Issues—What issues did the class perceive to be the most important? Why? What values were associated with the issues?

Effect and implications—How might the decision of the Senators affect the students' lives (if such a decision were actively made), can students find other similar examples of this situation in their community, state, etc? Was the decision realistic? How might our current national energy policy affect the North Central Plains?

Worksheet #3: *Reducing Your Use of Electricity*

1. What is the amount of electricity you are to save?_____
(from question on page 22)

Appliance	# kilowatt Hours	How Will Savings Be Achieved?
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
Total		(this number should be the same as your answer to question 3)

2. How easy was it for you to reduce the amount of electricity used by 25%

3. What items could you not consider eliminating?

Priorities and values—On what basis did the Senators make the decision. Were they voting from the standpoint of their own feelings and concerns or the interest of their own state? Why? Is the class in accord with the Senators' decision? Why?

Strategies—How were some of the strategies of persuasion used by the witnesses? Have students evaluate the effectiveness of the different strategies. Did the position which presented the strongest arguments and supportive data succeed in enlisting the support of the Senators?

Future problems—What future problems might arise as a result of the decision? How might they be resolved?

SUGGESTED SCHEDULE OF ACTIVITIES

Class Period	*Activity*
Part I	*"...Miles to Go—But How?"*
	Reading 1: Introduction
1	Activity 1: a) Student graphs (Handout #1) b) Discussion of results
2	Activity 2: a) Examine graph 2 and answer question
3	Activity 3: a) Complete Table 1 (Handout #2) and answer questions b) Examine graph 3 and answer questions
4	Activity 4: a) Discussion: Dilemma 1
5	b) Discussion: Dilemma 2
6	c) Discussion: Dilemma 3
7	d) Discussion: Dilemma 4
8	Activity 5: a) Prepare for debate
9	b) Conduct debate
Part II	*"The Nuclear Power Controversy"*
10	Activity 1: a) Reading 1: read or act out b) Group discussion: worksheet #1, Handout #3
11	c) Group presentations d) Town vote
12	Activity 2: a) Reading 2: Read or act out b) Discussion: Dilemma 1
13	Activity 3: a) Reading 3 b) Discussion: Dilemma 2 c) Complete worksheet #2, Handout #4
14	Activity 4: a) Reading 4 b) Discussion: Dilemma 3
15	c) Discussion: Dilemma 4
Part III	*"New Showdown in the Southwest"*
16	a) Reading 1, Section A b) Discussion of reading
17	Activity 1: c) Students determine their energy budget d) Worksheet #3, Handout #5
18	Activity 2: a) Reading 1, Section B b) Discussion and/or role play
19	Activity 3: a) Discussion: Dilemma 1
20	Activity 4: a) Reading 1, Section C Activity 5: b) Discussion, Dilemma 2
21	Activity 6: a) Reading 1, Section D Activity 7: a) Assign and prepare roles
22	a) Conduct Hearing b) Senate vote c) Debrief simulation

Selected Bibliography: ENERGY

The recent surge of interest and concern regarding energy has led to a plethora of books, articles, pamphlets, etc. written on the subject. Moreover, the controversy over the issues of safety, environmental effects, appropriate applications of technology and the like have generated much heated debate in both the public and scientific sectors. To adequately provide a complete perspective on the energy literature is therefore a task clearly beyond the scope of any one team of curriculum and subject area specialists.

We have, instead, selected a number of books providing basic information that may prove useful in the discussion of energy issues highlighted in this module. As a note of caution, we suggest that in reading any of these materials one must be aware that quite often each writer is an advocate of his/her position on the energy question and statements must be evaluated in light of the particular and sometimes subtle bias.

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