DOCUMENT RESUME

ED 190 348 SE 030 979

AUTHOR	Allen, Virginia: Hetherington, Martin
TITLE	Life Styles. Teacher's Guide and Student Guide. Net Energy Unit. Draft.
INSTITUTION	Michigan State Univ., East Lansing. Cooperative Extension Service.: Michigan State Univ., East Lansing. Science and Mathematics Teaching Center.
SPONS AGENCY	Department of Energy, Washington, D.C.: Michigan Dept. of Commerce, Lansing.
PUB DATE	28 Mar 79
GRANT	EC-77-6-01-5092
NOTE	29p.: For related documents, see SE 030 975-985 and ED 180 774. Pages 5-8 in the Teacher's Guide and 5-8 in the Student Materials removed due to copyright restrictions.
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Conservation Education: Curriculum Development: Decision Making: Elementary Secondary Education: Energy: *Energy Conservation: *Environmental Education: Fuel Consumption: *Futures (of Society): *Interdisciplinary Approach: Natural Resources: Planning: Public Policy: *Science Education: Social Studies
IDENTIFIERS	*Energy Education

ABSTRACT

This module is intended to assist the teacher in presenting lessons on the influence of energy on lifestyles now and in the future. Five activities are presented including: (1) a science fiction story: (2) lifestyles interview: (3) future projections: (4) energy usage and lifestyle: and (5) lifestyle differenees. The module is intended to cover six class sessions. A slide set and film loop are needed for some class sessions. Availability information is provided. (RE)

LIFE STYLES

By Virginia Allen & Martin Hetherington

Unit Title: Net Energy

Module Title: Life Styles Now and In The Future Energy is the limiting Factor

Description of Module: The purpose of this module is to help students understand how energy now and in the future will determine their lifestyle.

Activity 1: Science Fiction Story

Activity 2: Life Styles Interview

Activity 3: Projection into the Future Based on Past Experience

Activity 4: Back to the Source

Activity 5: Dramatization of Life Style Differences

The main objective of this module is to increase the students comprehension of how their life style relates to net energy.

Unit Objectives Met: 3h, 3i, 3j

Materials Needed:

Activity 1: None

Activity 2: None

Activity 3: Slide Series, Investigations in Life Science: Man and Nature, #6653. Biological Curriculum Study, 1975, "Man and the Biosphere: Energy Uses and Reserves."

Activity 4: Film Loop,"Energy: Back To The Source" #6645 developed by Biological Science Curriculum Study, Hubbard, Northbrook Illinois 60062.

Activity 5: None

Module Type: Optional

Content: Science or Social Science

Time Required:

Activity 1: 1 class period

Activity 2: 2 class periods plus outside interview time or two class periods including a guest to be interviewed in class.

Activity 3: 1 class period

Activity 4: One-half to one class period

Activity 5: 1 class period

Mode:

Activity 1: Reading and Discussion

Activity 2: Discussion and Interview

Activity 3: Slides, reading, discussion

Activity 4: Film loop and class discussion

Activity 5: Simple dramatic skits

The Youth Energy Project is funded by the Michigan Department of Commerce and the Michigan Energy Extension Service on a pilot basis. Michigan State University's Cooperative Extension Service (4-H - Youth Programs) and the Science and Mathematics Teaching Center are the project contractors. This material was prepared with the support of the U.S. Department of Energy (DOE) Grant No. EC-77-6-01-5092.

DRAFT

SAMPLE EVALUATION ITEMS

Activity 1

1. Name four advantages that the author lists of the energy-poor life of 1997.
2. Why is life worse for the suburban dweller in 1997?
3. How is the life style of 1997 different from today? What do you think is the major difference?

Activity 2

4. Can you identify three ways in which the person you interviewed used energy differently than we do today?
5. What are some of the vocabularly changes that have taken place as a result of our increased energy usages? Give three examples.
6. Based on your interview, what change could you make in your life style to help conserve energy?

Activity 3

7. What effect will the different energy usage styles have on future life styles?
8. Name three possible changes in life style which could conserve energy.

Activity 4

9. Describe the steps that take a record from petroleum to the trash heap.
10. How does the concept of net energy relate to our daily life as illustrated in this film loop?

Activity 5

11. Due to the nature of this module, there really are no sample evaluation items other than the completion of the dramatic sketch in a thoughtful way.

ACTIVITY 1

SCIENCE FICTION SHORT STORY

Part 1

Objective Addressed: Compare possible future life styles with the present.

Using the short story "The Nightmare of Life Without Fuel" by Isaac Asimov, this unit is designed to help students think about a future in which there is no fuel. The story is set in the not too distant future of 1997. It is reprinted from TIME, the Weekly Newsmagazine, in U.S. Energy Policy - Which Direction?, prepared by the National Science Teachers Association, January, 1978.[1]

There are excellent questions following the story which should be used and then further extended to build on the information which the students gathered about the recent past in the interview module.

Ask the students to read this very short story. Be sure to set the stage for their reading by asking some questions before they begin. Ask the students to read the story. Discuss it using the questions following the story as a beginning point in your discussion. Try to relate the discussion to the interviews concerning the recent past if possible. The discussion can also lead into the next module which is a projection into the future.

Note: The students may wish to find, read and discuss other science fiction stories which deal with the energy problems of the future.

PAGES 5-8 "THE NIGHTMARE OF LIFE WITHOUT FUEL"
REMOVED DUE TO COPYRIGHT RESTRICTIONS.

The Nightmare Life Without Fuel

People talk about an energy "crisis" all the time, but there are no long lines for gasoline, the cold winter is over, we have enough electricity to run our appliances, and gasoline prices aren't going up that fast anymore. So, where's the crisis? Well, maybe it's like President Carter says, "Our energy crisis is an invisible crisis, which grows steadily worse -- even when it is not in the news." So, how can we see an invisible crisis? Two ways will be given: One is a vision of the future which can only be called a nightmare. By looking at this, we can see what we hope will not come to pass. Then, we will look at several graphs to see if the present problem could actually get that bad.

The article "Nightmare Life Without Fuel," was written by Isaac Asimov, who is both a science fact and science fiction writer. As you read the article, think about the following question: Is this the way the future will really be like, or will it be different? After finishing the reading, answer the following questions.

Paragraphs are numbered to simplify your search for the answers.

1. In the first paragraph, the author says that this view of the future "need not prove to be accurate." What does he say <u>would</u> cause the vision to become real?

2. What is meant in Paragraph 3 when the cities are described as being "the great mineral mines and hardware shops of the nation?"

3. The author describes the end of the automobile in Paragraph 4. It is mentioned that "rationing was introduced to 'equalize sacrifice'," but that the cars just vanished anyway. What do you think was rationed? How do rations "equalize sacrifice?"

4. Throughout the article, the world of 1997 looks like a nightmare. The author, however, sees some advantages in the life of 1997 over that in 1977. Name four advantages that this energy-poor life has to offer.

5. Why is life worse for the suburban dweller in 1997 than for those living in the city (see Paragraph 8)?

6. In Paragraph 10, the author says the U.S. is still purchasing "some trickle" of oil from other nations. How is the U.S. paying for this energy? How does this affect life for the American people?

7. What sources of energy does the author say the U.S. might be using in 1997? Which seems to be relied upon the most? How does this differ from the U.S. in 1977?

8. What does the author mean by the last five lines, "And what can we do to prevent all this now. Now? Almost nothing. If we had started 20 years ago, that might have been another matter. If we had only started 50 years ago, it would have been easy."

Part II

Lifetimes of Ultimately Recoverable Resources[2]

Resource	UNITED STATES LIFETIMES With Constant 1973 Consumption	With Increased Consumption	Assumed Doubling Time in Years
Oil	80 years	35 years	16
Natural Gas	112 years	30 years	8
Coal	693 years	70 years	15

WORLD LIFETIMES With Increased Consumption	Assumed Doubling Time in Years
35 years	9
45 years	9
3,600 years	*

*World coal consumption has been nearly constant in the past 5 years. Thus, no estimate of increased consumption has been attempted.

The table above gives a reasonable answer to the question, "When will we run out of _____?" While no one can say with certainty when a resource will be exhausted, it is possible to make calculations based on two numbers: the amount of a resource that is available, and how fast it is being used up. Both of these facts need further explanation.

As you can see, the table uses the complicated phrase, "ultimately recoverable resources." Look at one resource - oil. In the United States, geologists have identified various locations where they know oil exists, or are reasonably certain it exists. They estimate that the United States has about 52 billion barrels of oil in discovered oil fields that remains to be extracted, and that 450 billion barrels remain in oil fields still unknown. This 502 billion barrel total is then a realistic upper limit of the total oil that the U.S. can count on. If, however, new methods are developed by which we can get oil from sources we now think are uneconomical, these estimates may have to be adjusted.

Questions

1. If a method is discovered that allows oil companies to extract oil from areas where they cannot do so today, how will this affect the lifetime calculations in the previous table?

2. Why is it important to use a conservative estimate of a resource's lifetime instead of a more optimistic estimate in making energy policy decisions?

3. If we consume the same amount of our own oil today as we did in 1973, our own oil resources will last _____ years. If consumption keeps increasing in the future at the same rate that it did in the past, we will double our consumption of oil in _____ years. This means that, assuming that our oil consumption continues to increase, we have only _____ years of petroleum left in the United States.

4. The formula for obtaining the doubling time is:

   $\text{Time}_{\text{double}}$ = 70 years divided by r (the growth rate in percent per year.)

   This means that if oil consumption grows at 4.4% per year, the doubling time is 70/4.4 = 16. What would happen to the doubling time if the rate of consumption decreased to 2%?

   Would the lifetime of a resource increase or decrease if the rate at which it is consumed decreases?

5. Based on the information last contained in the table, what energy resource will last us the most number of years?

ACTIVITY 2

LIFE STYLES INTERVIEW

Objective Addressed: Compare life styles of the recent past with the present.

This module is designed to help the students discover the way energy was used in life styles of the not too distant past. This will be accomplished by having the students design interview questions and then interview a person of retirement age. This interview may be done individually so that several different sets of answers can be compared. Alternatively, the interview might be conducted in class with a guest speaker. The information gathered in this interview should serve as a basis for studying life styles in the present and projecting future life styles based on different energy use alternatives.

Possible Interview Questions (These questions are only samples. It is best to have students develop their own questions as much as possible.)

1. When you were young, what kind of electrical kitchen appliances did your mother have and use? How did she manage without some of our more common appliances? Would you be willing to do without some of these now?
2. How was your house heated? At what temperature did your family keep the house in winter? What did you do about the heat in the summer? Did your house have insulation and storm windows?
3. What kind of daily transportation did you and your family use? How far did your family have to travel routinely? Where did your family do most of its shopping? How often did you go shopping?
4. What kind of entertainment did you enjoy? What kinds were available?
5. Were you a driver during World War II? How did you react to some of the restrictions then? What were they?

6. What kinds of vocabulary changes can you think of that are based on our increased energy usage or changing life style? Are there words that were common then that are no longer being used?
7. If every car in this country were limited to only ten (10) gallons of gasoline per week, how would you use your car differently than you use it now?
8. What kinds of energy uses do you think you could easily do without based on your past experience?
9. Have you ever considered your use of energy -- your energy decisions -- based on the concept of net energy?

After having worked with the introductory modules so that the students are familiar with the concept of net energy, this module is designed to get first hand information about the recent past. Use the first class period to formulate the interview question. Have the students do as much of this as possible. The included questions are only to be used as guides. You might have the students speculate as to what kind of answers they will get. Have the students interview someone on their own. They may also choose to interview a person as a small group rather than as individuals. The person being interviewed should be at least sixty years old -- older is even better.

The second class period should then be used to compare and tabulate the responses to the questions. From their interviews, the students may begin to be able to extend the experience of the past to the problems of the future. If it is not possible to have students interview on their own, a guest to be interviewed by the entire class may be invited to attend the second class period. This method probably is not as effective because only one view of the past will be obtained, but it is still more useful than no view of the past.

ACTIVITY 3

PROJECTION INTO THE FUTURE BASED ON PAST EXPERIENCE

Objective Addressed: Compare possible future life styles with the present. Describe some relationships between energy usage style and life style of the future.

Using the information gathered in the interviews, in the short story, based on personal experience, and from the slides and charts, the students will discuss the different life styles of the following periods: 25-35 years ago, 1 year ago, 5 years from now, the years 1985-2000, and beyond the year 2000. They will have the opportunity to project the different effects of different energy usage styles on the life style of the future.

Use the slide series Investigations in Life Science: Man and Nature, #6653, Biological Sciences Curriculum Study, 1975, "Man and the Biosphere: Energy Uses and Reserves." This series provides a good basic view of our energy uses and the amount of reserve we have. The students can use this to help formulate their hypotheses about future life styles.

Also use the chart on page 17 taken from U.S. Energy Policy - Which Direction? National Science Teachers Association, 1978.[3] This handout gives some possible energy strategies in three frames: 1977-1985, 1985-2000, and beyond 2000. What will happen if we do not follow these strategies or if they are not enough?

Another good chart is on page 18 taken from Research Outlook 1978, United States Environmental Protection Agency.[4]

Using all of the above materials, the student should not have too much difficulty beginning to think about the future. You should also encourage some of them to do some creative thinking, along the lines of the Asimov story. The

primary objective is for them to begin to realize the serious nature of our energy supply's limitations.

Show the slide series, discuss the charts. Divide the class into groups to work on each time period. You may even want to have more than one group for the future time periods. Each group would have a different set of givens concerning energy usages.

TOPIC	NEAR-TERM PRESENT TO 1985		MID-TERM 1985 - 2000		LONG-TERM 2000 - ?	
	Forecast	Plan	Forecast	Plan	Forecast	Plan
SOURCES OF INCOME						
MARITAL STATUS						
EDUCATION						
LARGE PURCHASES						

To fill out the chart above you should follow these two steps. (1) Think about what the future might be like for you and fill in your predictions under the column "forecast". One hint, keep track of your age in each of the three time periods. (2) Then, once you have decided on what the future will be like, fill in the column marked "plan". Here you should indicate how you plan on achieving the forecast that you have made. For example, if you plan on getting a specific job in the near term, then you should indicate how you plan on getting the job; any additional training you would need, etc. Try to be as specific in your forecasts and plans as you can.

Energy Supply Projections

Energy Source	1975	1985		2000	
		Plan**	Pre-Plan	Plan	Pre-Plan
Coal	15.3*	28.2	23.9	44.9	38.0
Domestic Oil	20.7	21.8	18.7	17.9	18.0
Oil Shale		.3	1.1	2.9	3.0
Oil Imports	12.8	13.3	24.3	13.0	28.2
Domestic Gas	18.6	17.6	17.8	15.4	14.2
Gas Imports	1.0	1.8	3.0	1.1	3.4
Nuclear	1.8	7.6	7.4	18.7	25.0
Solar (except Biomass)		.2	.1	1.8	1.4
Geothermal		.3	.2	2.7	2.5
Hydropower	3.0	3.1	3.1	3.6	3.6
Biomass				1.5	1.5
Total	73.2	94.2	99.6	123.5	138.8

Notes:
*Data expressed in Quads
**The National Energy Plan

Plan Source: U.S. Energy Research and Development Administration, 1977.

ACTIVITY 4

BACK TO THE SOURCE

Objective Addressed: Describe some relationships between energy usage style and life style.

This module uses the film loop "Energy: Back to the Source" #6645 developed by Biological Science Curriculum Study, Hubbard, Northbrook, Illinois 60062. This four minute film loop traces the history of a phonograph record backward from its end on the trash heap to its manufacturing and ultimate beginning as a petroleum product.

This short film loop does an excellent job of stimulating discussion and thought concerning the development of a product from its raw materials. Phonograph records are something that students of this age can relate to. This film loop can make them aware that even something as common for them as a phonograph record is dependent on petroleum for its manufacture. It also illustrates to what a great extent we live in a throw-away society. The loop can also lead into a discussion of net energy because many forms of energy are obviously involved at every stage of the phonograph record's life. There can even be ties to the values module in a discussion of our throw-away society.

In order to facilitate class discussion, you may want to consider some of the following questions. Be sure to add any that you think are important.

1. How does this film loop illustrate net energy? Name some of the steps in the life of the phonograph record and tell how they use energy.
2. What happens to that raw material -- petroleum -- when it is made into a phonograph record which eventually finds itself on the trash heap?
3. Do you think this is good or bad? Why?
4. What other common products use energy in their development? In what ways?

ACTIVITY 5

DRAMATIZATION OF LIFE STYLE DIFFERENCES

Objective Addressed: Compare possible future life styles with the present. Describe some relationships between energy usage style and life style of the future.

Using all of the material discussed, read and discovered in the past four class periods, the class will present a series of simple dramatic sketches portraying the different life styles based on the different attitudes toward and availability of energy in the various time studies.

Using all of the experiences in the preceeding three modules guide the students into presenting simple skits portraying the different possible life styles. These should not be elaborate. Divide the class into groups. Assign the time periods or let the groups decide. Give them a few minutes to work out their skit. Present the skits to the class. Some of these may provoke class discussion. If this discussion is thoughtful, encourage it.

REFERENCES

1. The Nightmare Life Without Fuel, By Issac Asimov. Reprinted from TIME in U.S. Energy Policy - Which Direction? Prepared by National Science Teachers Association, January, 1978, p. 43.

2. Energy-Environment Source Book, By John Fowler. Tables 5-6 and 5-7. National Science Teachers Association, Washington, D. C., 1975.

3. U.S. Energy Policy - Which Direction? National Science Teachers Association, 1978, pg. 72.

4. Research Outlook, 1978. EPA 600/9 78-001, June 1978.

PAGES 5-8 "THE NIGHTMARE OF LIFE WITHOUT FUEL"
REMOVED DUE TO COPYRIGHT RESTRICTIONS.

The Nightmare Life Without Fuel

People talk about an energy "crisis" all the time, but there are no long lines for gasoline, the cold winter is over, we have enough electricity to run our appliances, and gasoline prices aren't going up that fast anymore. So, where's the crisis? Well, maybe it's like President Carter says, "Our energy crisis is an invisible crisis, which grows steadily worse -- even when it is not in the news." So, how can we see an invisible crisis? Two ways will be given: One is a vision of the future which can only be called a nightmare. By looking at this, we can see what we hope will not come to pass. Then, we will look at several graphs to see if the present problem could actually get that bad.

The article "Nightmare Life Without Fuel," was written by Isaac Asimov, who is both a science fact and science fiction writer. As you read the article, think about the following question: Is this the way the future will really be like, or will it be different? After finishing the reading, answer the following questions.

Paragraphs are numbered to simplify your search for the answers.

1. In the first paragraph, the author says that this view of the future "need not prove to be accurate." What does he say <u>would</u> cause the vision to become real?

2. What is meant in Paragraph 3 when the cities are described as being "the great mineral mines and hardware shops of the nation?"

3. The author describes the end of the automobile in Paragraph 4. It is mentioned that "rationing was introduced to 'equalize sacrifice'," but that the cars just vanished anyway. What do you think was rationed? How do rations "equalize sacrifice?"

4. Throughout the article, the world of 1997 looks like a nightmare. The author, however, sees some advantages in the life of 1997 over that in 1977. Name four advantages that this energy-poor life has to offer.

5. Why is life worse for the suburban dweller in 1997 than for those living in the city (see Paragraph 8)?

6. In Paragraph 10, the author says the U.S. is still purchasing "some trickle" of oil from other nations. How is the U.S. paying for this energy? How does this affect life for the American people?

7. What sources of energy does the author say the U.S. might be using in 1997? Which seems to be relied upon the most? How does this differ from the U.S. in 1977?

8. What does the author mean by the last five lines, "And what can we do to prevent all this now. Now? Almost nothing. If we had started 20 years ago, that might have been another matter. If we had only started 50 years ago, it would have been easy."

Part II

Lifetimes of Ultimately Recoverable Resources[2]

UNITED STATES LIFETIMES

Resource	With Constant 1973 Consumption	With Increased Consumption	Assumed Doubling Time in Years
Oil	80 years	35 years	16
Natural Gas	112 years	30 years	8
Coal	693 years	70 years	15

WORLD LIFETIMES

With Increased Consumption	Assumed Doubling Time in Years
35 years	9
45 years	9
3,600 years	*

*World coal consumption has been nearly constant in the past 5 years. Thus, no estimate of increased consumption has been attempted.

The table above gives a reasonable answer to the question, "When will we run out of _____?" While no one can say with certainty when a resource will be exhausted, it is possible to make calculations based on two numbers: the amount of a resource that is available, and how fast it is being used up. Both of these facts need further explanation.

As you can see, the table uses the complicated phrase, "ultimately recoverable resources." Look at one resource - oil. In the United States, geologists have identified various locations where they know oil exists, or are reasonably certain it exists. They estimate that the United States has about 52 billion barrels of oil in discovered oil fields that remains to be extracted, and that 450 billion barrels remain in oil fields still unknown. This 502 billion barrel total is then a realistic upper limit of the total oil that the U.S. can count on. If, however, new methods are developed by which we can get oil from sources we now think are uneconomical, these estimates may have to be adjusted.

Questions

1. If a method is discovered that allows oil companies to extract oil from areas where they cannot do so today, how will this affect the lifetime calculations in the previous table?

2. Why is it important to use a conservative estimate of a resource's lifetime instead of a more optimistic estimate in making energy policy decisions?

3. If we consume the same amount of our own oil today as we did in 1973, our own oil resources will last _____ years. If consumption keeps increasing in the future at the same rate that it did in the past, we will double our consumption of oil in _____ years. This means that, assuming that our oil consumption continues to increase, we have only _____ years of petroleum left in the United States.

4. The formula for obtaining the doubling time is:

   $\text{Time}_{\text{double}}$ = 70 years divided by r (the growth rate in percent per year.)

   This means that if oil consumption grows at 4.4% per year, the doubling time is 70/4.4 = 16. What would happen to the doubling time if the rate of consumption decreased to 2%?

   Would the lifetime of a resource increase or decrease if the rate at which it is consumed decreases?

5. Based on the information last contained in the table, what energy resource will last us the most number of years?

TOPIC	NEAR-TERM PRESENT TO 1985		MID-TERM 1985 - 2000		LONG-TERM 2000 - ?	
	Forecast	Plan	Forecast	Plan	Forecast	Plan
SOURCES OF INCOME						
MARITAL STATUS						
EDUCATION						
LARGE PURCHASES						

To fill out the chart above you should follow these two steps. (1) Think about what the future might be like for you and fill in your predictions under the column "forecast". One hint, keep track of your age in each of the three time periods. (2) Then, once you have decided on what the future will be like, fill in the column marked "plan". Here you should indicate how you plan on achieving the forecast that you have made. For example, if you plan on getting a specific job in the near term, then you should indicate how you plan on getting the job; any additional training you would need, etc. Try to be as specific in your forecasts and plans as you can.

Energy Supply Projections

Energy Source	1975	1985		2000	
		Plan**	Pre-Plan	Plan	Pre-Plan
Coal	15.3*	28.2	23.9	44.9	38.0
Domestic Oil	20.7	21.8	18.7	17.9	18.0
Oil Shale		.3	1.1	2.9	3.0
Oil Imports	12.8	13.3	24.3	13.0	28.2
Domestic Gas	18.6	17.6	17.8	15.4	14.2
Gas Imports	1.0	1.8	3.0	1.1	3.4
Nuclear	1.8	7.6	7.4	18.7	25.0
Solar (except Biomass)		.2	.1	1.8	1.4
Geothermal		.3	.2	2.7	2.5
Hydropower	3.0	3.1	3.1	3.6	3.6
Biomass				1.5	1.5
Total	73.2	94.2	99.6	123.5	138.8

Notes:
* Data expressed in Quads
**The National Energy Plan

Plan Source U.S Energy Research and Development Administration, 1977.