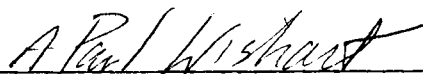
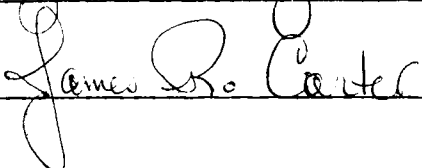


To the Graduate Council:

I am submitting herewith a thesis written by Janice K. Kell entitled "An Evaluation of Industry-Produced Energy Education Materials." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Science Education.


A. Paul Wishart, Major Professor

We have read this thesis
and recommend its acceptance:

Accepted for the Council:


Vice Chancellor
Graduate Studies and Research

AN EVALUATION OF INDUSTRY-PRODUCED
ENERGY EDUCATION MATERIALS

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Janice K. Kell

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ABSTRACT

The purpose of this study was to identify, collect, and evaluate industry-produced energy education materials. Special emphasis was placed on identifying any biases in the materials which might have undue influence on students' energy attitudes.

Energy industries, utilities, and their trade associations were chosen, and letters were sent requesting sets of energy materials. Of the 96 letters sent requesting materials, 46 responses were received; 33 respondents sent materials. Approximately 60 percent of the utilities, 20 percent of the industries, 20 percent of the industries, and 20 percent of the trade associations supplied materials for evaluation.

An Evaluation Guide was developed and checked for reliability using samples from the material received. The Evaluation Guide, having been found reliable, was then used to evaluate 37 examples of the materials. Thirteen teacher's guides with student materials, seven comic books, ten pamphlets, three coloring books, two booklets of experiments, a game, and a poster were evaluated.

The majority of the materials were recently produced, and most were supplementary rather than complete units on energy. Intended grade levels were available on the teacher's guides but not the other types of materials. Reading, technical, and interest levels tended to correlate with stated grade levels. Teacher's guides also had realistic and attainable objectives.

Most of the materials contained current information, but only about half of the materials presented alternative views. Topical issues were treated fairly in most of the materials. The materials tended to be free of blatant advertising and promotion of company policies.

The production quality of the materials was generally good, and instruction guidelines were clear. Some of the teacher's guides provided means for measuring student outcomes, but very few encouraged teachers to evaluate the materials.

It was concluded that local utilities, along with the largest energy companies and their associations, were the most likely sources of materials. Overall, industries', utilities', and trade associations' materials did not present sufficient alternatives to their company policies, but the materials are relatively free of promotion of company products, policies, or points of view. Most of the materials handled controversial subjects fairly well and were not overtly biased. With careful screening by teachers, industry-produced materials could contribute variety and different perspectives to a teacher's energy education resources.

TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION	1
Rationale.	2
Statement of Purpose	3
Questions.	4
Assumptions.	4
Limitations of the Study	4
Summary of Chapters.	5
II. REVIEW OF RELATED LITERATURE	6
Need For Energy Education.	6
Who Should Produce Energy Education Materials.	7
Evaluation of Energy Education Materials	8
A Critique of Industry-Produced Materials.	11
Summary.	12
III. PROCEDURES	13
Criteria for Selection of Industries	13
Development of an Evaluation Instrument.	14
Methods.	16
IV. PRESENTATION OF RESULTS.	18
Availability of Energy Materials	18
Evaluation Results	19
V. SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS. .	31
Summary.	31
Conclusions.	33
Implications	35
Recommendations for Further Study.	36
BIBLIOGRAPHY.	37
APPENDICES	41
APPENDIX A.	42
APPENDIX B.	44
APPENDIX C.	48
APPENDIX D.	49
VITA.	51

LIST OF TABLES

TABLE	PAGE
I. SUMMARY OF EVALUATION RESULTS FOR ITEMS HAVING TO DO WITH OBJECTIVES	23
II. SUMMARY OF EVALUATION RESULTS FOR ITEMS HAVING TO DO WITH ABILITIES	24
III. SUMMARY OF EVALUATION RESULTS FOR ITEMS HAVING TO DO WITH CONTENT	26
IV. SUMMARY OF EVALUATION RESULTS FOR ITEMS HAVING TO DO WITH UTILIZATION CHARACTERISTICS	27
V. SUMMARY OF EVALUATION RESULTS FOR ITEMS HAVING TO DO WITH PRESENTATION OF MATERIALS	29
VI. SUMMARY OF EVALUATION RESULTS FOR ITEMS HAVING TO DO WITH EVALUATION	30

CHAPTER I

INTRODUCTION

One of the more critical problems facing this country today is energy availability and its proper use. Since World War II, we have used--even considered it our right to use--vast quantities of energy resources, particularly petroleum (Kushler, 1979). The oil embargo of the early 70's made many Americans realize that traditional energy resources are limited. New decisions about the energy future are going to be necessary if we are to maintain our present lifestyles and level of productivity.

The educational sector is becoming increasingly aware of the energy problem and is beginning to address the energy decision-making challenge. Educators everywhere are introducing energy concepts and issues into all phases of the curriculum. If teachers are going to teach energy concepts and issues in their classrooms, then energy education materials are needed. These energy materials and programs "should provide a balanced view of complex and controversial issues" (Kuhn, 1979, p. 619).

Different sectors of society have responded with teacher's guides, student workbooks, maps, posters, and audiovisuals. Besides the Department of Energy, which is the largest single producer of energy education materials, private industries and the utilities account for many of the free and inexpensive materials teachers are using in their classrooms. In an article in Engineering Times, Hickerson (1981)

asked, "Are these valid educational materials? Or are they merely propaganda foisted upon unsuspecting children?" (p. 1).

Harty, in Hucksters in the Classroom (1979), stated that, because in most cases schools cannot afford to supply teachers with up-to-date materials, "industry has recognized the prospects for self-advancement" (p. 2). Industry claims less self-serving motives for making energy education materials available. Industry representatives say they are, for the most part, responding to requests from teachers for supplemental materials on energy topics. Walter Purdy (1980) of the Edison Electric Institute wrote that "schools and utilities, in tandem, have the duty of disseminating information on vital energy topics" (p. 5).

Whatever industry's reasons or motives, the fact remains that nearly every teacher who uses energy as a topic in his/her classroom, has comic books from Exxon, pamphlets from Shell Oil, or spirit masters produced by Amoco.

Rationale

Ten years ago a teacher would have had to search for energy education materials, and probably the search would not have been very fruitful. Today, teachers are overwhelmed by the volume of curriculum material covering all energy topics. Not only is there a substantial volume of energy material, but materials also come in many different formats. Many of the materials and resources come from utilities, energy industries, or trade associations of the utilities and industries.

A major question is: Are these materials desirable supplements to the energy curriculum?

These industry-produced materials would significantly contribute to teachers' resources if teachers knew of the materials' availability and biases. If teachers recognized and then showed students any propaganda or biases, these materials might be used effectively, especially to teach critical thinking. However, Kushler has been quoted as saying:

due to very real limitations in time and resources, teachers are often unable to carefully prescreen industry materials to determine different perspectives and possible biases (Hickerson, 1981, p. 2).

This study was undertaken in order to provide a listing of available energy education materials as well as to determine possible biases. This compilation could help teachers select suitable classroom materials and allow industries to learn how their materials are perceived by educators.

Statement of Purpose

The purpose of this study was to identify, collect, and evaluate energy education materials produced by selected industries with a particular interest in America's future energy decisions.* Special emphasis was placed on the accuracy of the information presented in the materials and on any biases which might be construed as having undue influence on students' energy attitudes.

*See Chapter III for Criteria for Selection of Industries.

Questions

The following questions were addressed:

1. What energy education materials are available from energy industries, utilities, and trade associations?
2. To what extent do curriculum materials produced by energy industries, utilities, and trade associations show a bias for their products or points of view?
3. To what extent can industry-sponsored materials properly contribute to a teacher's energy education resources?

Assumptions

This research was conducted based on the following assumptions:

1. Any sociological i.e., racial, sexual, ethnic, or religious, effects resulting from the use of the materials will not have a direct impact on this study.
2. Free and inexpensive industry-produced energy education materials will continue to supplement teachers' curricula.

Limitations of the Study

1. Only materials produced for grades K-12 were considered.
2. No materials produced in a language other than English were considered.
3. Only materials produced by energy industries (as defined in Chapter III) were considered.

Summary of Chapters

This study is organized into five chapters. Chapter I contains an introduction to the study, the rationale, a statement of purpose, questions, assumptions, and limitations. Chapter II reviews related literature and discusses the need for energy education, who should produce energy education materials, evaluation of energy education materials, and industry-produced materials. Chapter III contains the criteria for selection of industries; the methods for developing the evaluation instrument, and the methods used in this study. A presentation of the evaluation results is contained in Chapter IV, and summary, conclusions, implications, and recommendations are located in Chapter V.

CHAPTER II

REVIEW OF RELATED LITERATURE

A review of literature relating to energy education materials and their evaluation evidences several areas of interest. Most authors examined the need for energy education and subsequently discussed the available materials. Several evaluations of energy-related materials and criticisms of industry-produced materials were found.

Need For Energy Education

According to a recent study by the National Assessment of Educational Progress (NAEP) (1978), it was determined that most of the young adults surveyed were not knowledgeable on energy issues, such as, conversion processes, supply and demand, energy reserves, and the state-of-the-art in energy technology. There was almost unanimous agreement (96 percent) among the young adults that they wanted more information on energy problems and ways to conserve.

Even before the NAEP study, many educational leaders suggested that education could help supply the energy information needed by teachers and students (Fowler, 1976; Jones and Steinbrink, 1977). According to Kryger (1978), former President Carter's statements on energy clearly show that education should take the responsibility to inform and prepare students for the future. In his dissertation, Kooi (1979) stated, "educational institutions are . . . in positions to provide energy information to the American people" (p. 3).

Champagne and Klopfer (1977) maintained that America's energy future depends upon

citizens who are knowledgeable, who are aware of their personal values, who are skillful problem solvers and decision makers, who have well-defined personal goals . . . (p. 10).

Gierke (1978) stated that the real challenge for energy education is the modification of energy attitudes and values.

In an article on the ethics underlying energy education, Allen and LaHart (1979) discussed the values which will determine the future of our world. They reported that educators can no longer ignore "serious cultural moral issues" (p. 350) such as energy and that "the goal of energy education is moral sensitivity and action" (p. 351). Kuhn (1979) agreed with Allen and LaHart as evidenced by his comment that "energy education should . . . have an effect on our attitudes and values" (p. 609).

The NAEP and other sources have established the need for energy education. Further, energy education should cover not only basic energy information (Kushler, 1979), but should help students define their values and attitudes.

Who Should Produce Energy Education Materials

Some energy educators believe energy education materials need to be designed by practicing classroom teachers (Fowler, 1976; Kryger, 1978). Harty (1979) agreed and even went so far as to condemn the motives of anyone with a vested interest who produces and distributes energy materials. Harty noted that, because energy is such a controversial issue, materials should be free of private intervention.

On the other hand, Purdy (1980) stated that education and industry can cooperatively produce good instructional materials. Purdy took this point one step further when he said "schools and utilities, in tandem, have the duty of disseminating information on vital energy topics" (p. 5). He pointed out that most industries and utilities have educational panels to assist in the development of their materials and are thereby striving for a lack of bias in the materials they produce.

Based on his own informal study, Buethe (1979) observed that industries try to "downplay their own special interests" (p. 163) when producing materials. Further, he stated that industries generally produce good quality materials teachers appreciate.

Because of the cost and time factors, it is probably unreasonable to expect practicing classroom teachers to produce quality energy education materials. Energy educators may very well have to rely on industry to supply current energy materials (Purdy, 1980; Kushler, 1979).

Evaluation of Energy Education Materials

Champagne and Klopfer (1977) stated "that the proper kinds of instructional materials can play a significant role in enabling the nation to cope with the energy dilemma" (p. 7). Their paper contained a comprehensive list of questions for teachers, librarians, and supervisors to help evaluate energy education programs and materials. Banathy and Mills (1978) also developed a listing of criteria for evaluation of energy materials. Neither of these publications went beyond listing criteria for evaluation.

Buethé (1979) did not use a particular list of criteria when he examined energy education materials. He concluded that many are "ill-conceived, opportunistic, untested and outdated" but that "some are excellent" (p. 162).

The Michigan Consumer Education Center (1978) has published an "Educator's Guide for Using Business Sponsored Resources in Consumer Education Classrooms." The Center suggested that the teacher consider the company's objective in producing the material and review the materials carefully looking for a possible biased point of view before using the resource. If such a bias exists, the teacher should select additional resources which will provide other viewpoints. The Center provided a checklist for evaluation which included content, namebrand, and bias; suitability for the classroom; and format, packaging, and cost.

Niedermeyer and Roberson (1981) have also developed a checklist for reviewing energy education programs. The four divisions of the checklist are pupil learning, program materials, program evaluation, and time requirements. A similar set of criteria were used by Energex, Inc. (1980) to evaluate 24 energy education programs for Atlantic Richfield, Inc. Many government publications were included in the Energex study, but it contained no evaluation of pamphlets and comic books which make up the bulk of materials distributed by many utilities.

Although the purpose of the report by the Education Commission of the States (1979) was not to evaluate materials, they did report that many states are developing curriculum guides and are in the process of evaluating these materials. The Commission also asked State Energy

Agencies to recommend suitable energy education materials. In order of preference, the Agencies recommended materials produced by the National Science Teachers Association (NSTA) "Project for an Energy Enriched Curriculum," "Energy and Man's Environment" sponsored by utilities, and "Energy and Society" produced by the Biological Science Curriculum Study. These recommendations were not necessarily the results of formal evaluation processes, but they did indicate a certain level of discrimination on the part of State Energy Agencies.

A survey of state-produced energy education materials was done by Jones and Steinbrink (1977). They collected the curricula produced by 20 states and described the characteristics of the materials. Jones and Steinbrink observed that, generally, these materials tended to stress technical topics, lacked theme consistency, and did not help define an alternative energy future.

Two other major studies on the evaluation of energy education materials were found in the literature. A dissertation by Kooi (1979) evaluated the materials in the NSTA "Project for an Energy Enriched Curriculum." This study evaluated the extent of bias in the materials by looking at their treatment of future energy alternatives and their usefulness based on current criteria for effective energy education. Kooi reported some discrepancies between intended and actual reading levels and some bias. The bias was considered unintentional, however, because it was inconsistent.

Miller and others (1979) reviewed Department of Energy materials produced by Oak Ridge Associated Universities and NSTA. Teacher users responded favorably on all the points evaluated. Evaluation items

included student interest; relevance to students' experience, background, and geographic region; achievement of objectives; impact on students' awareness; appropriateness of reading and technical levels; and ease with which the materials fit into the existing curricula.

A Critique of Industry-Produced Materials

Harty (1979) contended that industry-produced materials in the classroom are nothing more than "propaganda" which "in the field of energy education . . . is particularly heavy" (p. 19). A recent study by Kushler (1979) for the Michigan Extension Service supported Harty's opinion; especially if one of the goals of energy education is the development of a conservation ethic. Based on energy conservation attitudes, Kushler reported "students who learned about energy from materials provided by utilities and oil companies had significantly lower scores--even lower than those who were not taught anything about energy" (p. 15).

An opposing view was expressed by Purdy (1980). Purdy, a representative of the Edison Electric Institute, stated "it would be unfair . . . to conclude that the use of business-sponsored materials will brainwash or con students" (p. 5). Purdy's viewpoint is similar to that of other representatives of energy industries and utilities, who perceive it to be their responsibility to supply teachers with energy materials.

Summary

Based on the literature reviewed, energy education is deemed necessary if we are to have informed citizens making future energy decisions. These future decisions will depend on the attitudes and values instilled in students by energy education materials. The viewpoints of the sponsor of these materials may or may not be a factor affecting the students' energy attitudes and values. Industry-sponsored materials have been both condemned as propaganda and considered valuable as supplements to the curriculum. There has been some formal evaluation of energy materials (particularly the NSTA materials). In spite of the controversy surrounding industry-sponsored materials, however, no study has been done to systematically evaluate these materials.

CHAPTER III

PROCEDURES

In order to identify, collect, and evaluate industry-produced energy education materials, certain procedures were followed. This chapter will explain criteria for selection of industries, the development of an evaluation instrument, and a description of the methods used.

Criteria for Selection of Industries

Many industries are producing energy education materials for use in the classroom. The following criteria were used to identify the industries for this study.

1. The major product(s) of the company had to be energy related. Only those companies listed in Fortune (1981) magazine's 500 largest industries with the following product identification codes received requests for materials: 10--mining, crude oil production and 29--petroleum refining. Other companies may now or in the future produce energy materials but because they are not recognized as energy producing companies by Fortune magazine, they were not considered. Energy related trade associations as listed in the Encyclopedia of Associations (1981) under the Trade, Business, and Commercial categories were also asked for materials, as were the top 50 utilities listed in Fortune (1980).

2. In order to be considered for this study, the materials had to have been easily obtainable by classroom teachers. Materials evaluated in this study were available upon written request.
3. The materials had to be specifically designed for classroom use. Examples are information pamphlets, teacher's guides, student worksheets, posters, and spirit masters. Items such as annual stockholder's reports were not evaluated.
4. Because teachers tend to be more selective in choosing materials they have to buy, only free or inexpensive (\$5.00 or less) materials were considered.
5. Although many audiovisual aids are available from energy industries, the evaluation instrument was designed for print materials.

Development of an Evaluation Instrument

Several studies and articles have suggested criteria for evaluating energy materials; especially, Kooi (1979), Miller (1979), Banathy (1978), and Niedermeyer and Roberson (1981). However, none of the studies or articles had developed an instrument in an easily used format. Kooi had designed a matrix for evaluating the NSTA "Project for an Energy Curriculum" materials, but the matrix was complicated. Although it could have been revised to facilitate its use, the author decided that other instruments more closely met the needs of this study. The Niedermeyer and Roberson instrument was a

simple checklist but it was more appropriate for evaluating entire programs than individual materials.

The National Association for Industry-Education Cooperation (NAIEC) (1977) had produced "A Guide for Evaluating Industry-Sponsored Educational Materials." It is a scale-type instrument, similar to the "Educator's Guide for Using Business Sponsored Resources in Consumer Education Classrooms" published by the Michigan Consumer Education Center (1978). Incorporating criteria for evaluation suggested by others, these two instruments were adapted for use in this study. The categories of questions in the NAIEC guide were used to outline the evaluation items.

The evaluation instrument was checked for reliability in the following manner. Five educators with expertise in energy education used the instrument to evaluate eight representative samples from the energy education materials under study. All the categories of materials including teacher's guides, student worksheets, spirit masters, comic books, pamphlets, and posters were evaluated. These materials included samples from energy industries, utilities, and trade associations.

All the responses to evaluation items 8-25 on the Evaluation Guide (Appendix A) were recorded in a matrix. To determine the levels of agreement between the evaluators on any given piece of material, the modal response was determined for each evaluation item. An item was deemed reliable if, for at least five of the eight materials evaluated, all the evaluators' responses were within one point of the item's modal response. All items qualified under this reliability criterion.

This investigator also used the evaluation instrument to evaluate the same eight materials. All the responses to items 8-25 for each material were within one point of the other evaluators' modal responses.

Methods

After the industries, utilities, and trade associations were chosen (Appendix B) according to the established criteria, 96 letters (Appendix C) were sent to them requesting available educational materials. After the majority of the materials arrived, representative samples were selected by the investigator and used to test the reliability of the evaluation instrument as described in the previous section.

The evaluation instrument, having passed the reliability check, was then used to evaluate 37 of the materials. The following system was used to reduce the materials to be evaluated to a more manageable number. Materials evaluated were those that were:

1. developed and distributed exclusively by a particular company or association;
2. teacher's guides and student workbooks or worksheets;
3. pamphlets or comic books distributed by four or more of the respondents.

Materials specific to an industry were evaluated because they were unique. All but two teacher's guides and student workbooks were evaluated because of their potential value to instruction. The two exceptions were several booklets of experiments sponsored

by the American Gas Association and the Edison Foundation. The booklets in each set were all similar in format and content so only samples from each set were evaluated.

Many companies, utilities especially, distribute energy materials in the form of comic books and pamphlets. Almost all of these materials are produced by others than the utility and purchased for distribution by the utility. Comic books and pamphlets are valuable resources but more hours of instruction are spent using materials in complete units, so these materials were sampled for evaluation. Because of the similarity among the comic books and among the pamphlets, only representative samples, that is, those that were distributed by four or more of the companies, were evaluated.

The evaluation results were recorded on a matrix by type of material and by evaluation item to look for patterns of responses. The patterns were then entered on tables for summary purposes.

CHAPTER IV

PRESENTATION OF RESULTS

The results of the search for industry-produced energy education materials and the evaluation of the materials received were used to determine the availability and freedom from bias of energy education materials. Thirty-seven different examples of materials (Appendix D) were evaluated by the investigator using the Evaluation Guide (Appendix A). Results are discussed in this chapter under Availability of Energy Materials and Evaluation Results.

Availability of Energy Materials

The industries, utilities, and trade associations to which letters requesting materials were sent are listed in Appendix B. Forty-six energy industries as listed in Fortune (1981) magazine's top 500 industries received letters, and 18 of these responded to the request for classroom materials on energy, usually within four weeks. Ten industries sent educational materials in the form of teacher's guides, spirit masters, and pamphlets, and the other eight explained that they had not developed any materials suitable for teaching energy. There were eight energy related industries for which no address could be found.

The response from the utilities was much higher than the response from the energy industries. Of the 35 utilities which received letters, 20 sent educational materials or catalogues, and one

replied that it had no materials available. It was unnecessary to order any materials from the catalogues sent. A cross-check indicated that all the materials listed in the catalogues had already been received from other utilities.

The Encyclopedia of Associations (1981) listed 15 associations related to coal, electricity, and petroleum production; fuels; and mining. Letters were sent to all 15 associations. Seven responded, but only three of the seven sent educational materials.

Evaluation Results

The results of the evaluations of the materials are presented in two parts corresponding to the sections of the Evaluation Guide. The first section of the Evaluation Guide (items 1-7) is primarily descriptive information and is discussed first. The second section of the Guide (items 8-25) details information on the content and use of the materials and is divided into categories. In the second section, each item has a scale of responses from one to four: one and two were considered positive responses; three and four were considered negative responses. Each item also has a "not applicable" response for use when an item did not apply to a particular piece of material.

General Characteristics

Title of material--item 1. All the materials evaluated had titles which were fairly descriptive of the content.

Date produced--item 2. Of the 37 different materials evaluated, only four did not have a publication date. Twenty-five of the remaining

materials were produced within the last five years, and four of these were developed in 1981.

Sponsor--item 3. Teacher's guides, student workbooks, and spirit masters were mainly distributed by energy industries and trade associations. Only three of the 20 responding utilities sent teacher's guides and student materials. It should be noted that many utilities indicated that they have teaching units available which used films or filmstrips. These were not considered because of the required audiovisuals.

The comic books came mainly from utilities, and the pamphlets came from all three groups--industries, utilities, and associations. The source of the comic books and pamphlets is worth noting. Culver Publications produced all but one of the comic books evaluated. The exception was a Mickey Mouse and Goofy comic book distributed by Exxon and a few utilities. Culver makes these comic books on energy topics available for purchase by utilities which, in turn, distribute them free to educators. Channing L. Bete Company produces pamphlets on energy topics and issues which oil companies and utilities purchase and distribute free to teachers. Four of the 10 pamphlets evaluated were developed by Channing L. Bete Company.

Some utilities are now sponsoring one or more of the major energy curriculum projects that are privately developed and produced. These projects--"Energy and Man's Environment," "Energex," etc.--were considered to be beyond the scope of this study and therefore were not evaluated.

Type of material--item 4. All of the categories of materials were represented by at least one evaluation. Most of the teacher's guides were accompanied by student materials of some sort; especially, workbooks or spirit masters. None of the companies distributed student workbooks or spirit masters without teacher's guides. Thirteen sets of materials with teacher's guides were evaluated, seven different comic books, ten pamphlets, one poster, and even materials in the "other" category.

The material is complete or supplementary--item 5. In order to be considered a complete unit, the material had to have teacher's instructions, student materials, and stated objectives. The materials should also have covered an energy topic or issue fairly completely. Nine of the 37 evaluated materials were considered complete units.

Supplementary resources--item 6. Only six of the materials including two of the pamphlets recommended supplementary resources.

Intended grade level--item 7. Appropriate grade levels were indicated on 11 of the 13 teacher's guides. Six teacher's guides were aimed at the elementary level (both primary and intermediate) and five were designated for the secondary level. Of the remaining 24 materials evaluated, only two of the pamphlets suggested grade level. For most of the materials without a stated grade level, however, it could be inferred.

The second section involved the categories of Objectives, Abilities, Content, Utilization, Presentation, and Evaluation. Tables at the end of each category present summaries of the evaluation results.

Only three types of materials are included in the tables because the "other" category did not lend itself to summarization.

Objectives

Clearly stated objectives--item 8. In order to receive a positive rating on this item, the material had to have had a list of objectives rather than statements of purpose obscured in a paragraph. Nine of the 13 teacher's guides received positive responses on this item. The comic books did not have stated objectives, and the pamphlets had either none or poorly stated objectives. (Exceptions to this were the comic books from Duquesne Light which had designed lesson plans with objectives to go with the same Culver comic books other utilities distributed.) Other materials varied as to whether or not they had objectives. The Edison Foundation experiment booklets, for example, did not even have stated objectives for each experiment.

Realistic objectives--item 9. To receive a positive response on this item, the material's objectives had to be judged as realistic in relation to the material's scope and the intended grade level. If the objectives were clearly stated, they were deemed to be realistic.

Meeting the stated objectives--item 10. If the material's objectives could be met by using its suggested lesson plans, it received a positive response on this item. As was true in judging realistic objectives, if the objectives were clearly stated in the material, they could be reached through the use of the material. An exception was the material developed by Houston Lighting and Power Company. Although its objectives were clearly stated, the student materials did not facilitate meeting those objectives.

A summary of the evaluation results for the Objectives category may be found in Table I.

TABLE I
SUMMARY OF EVALUATION RESULTS FOR ITEMS
HAVING TO DO WITH OBJECTIVES*

	Teacher's Guides with Student Materials			Comic Books			Pamphlets		
	Pos.	Neg.	NA	Pos.	Neg.	NA	Pos.	Neg.	NA
Clearly Stated Objectives	9	4	0	0	0	7	1	9	0
Realistic Objectives	12	0	1	0	0	7	2	1	7
Meeting The Stated Objectives	11	1	1	0	0	7	1	2	7

*Items 8, 9, and 10.

Abilities

Appropriate reading level--item 11. Vocabulary and sentence structure were considered when judging reading level. With one exception, those materials with stated grade levels had corresponding reading levels. "Facts About Oil," a teacher's guide and pamphlet distributed by The American Petroleum Institute, had a reading level beyond its suggested elementary grade level.

Appropriate technical level--item 12. The technical level tended to be satisfactory for those materials with a stated grade

level. "Facts About Oil" contained information too difficult for its intended elementary level, and a Culver comic book, entitled "Mr. Edison's Dilemma," tried to present energy and economic information too technical for a comic book format.

Appropriate interest level--item 13. With some exceptions, stated grade levels had appropriate interest levels. "Living With Energy" from Amoco, designed for grades 7-10, contained detailed economic information which is probably of little interest to 7th graders. The Houston Lighting student materials were judged to be too juvenile for their 6-9 grade level. It could be inferred from the content of three of six of the Culver comic books that they were intended for high school students; however, the interest level was inappropriate for that age student.

Table II present a summary of the Abilities category.

TABLE II
SUMMARY OF EVALUATION RESULTS FOR ITEMS
HAVING TO DO WITH ABILITIES*

	Teacher's Guides with Student Materials			Comic Books			Pamphlets		
	Pos.	Neg.	NA	Pos.	Neg.	NA	Pos.	Neg.	NA
Appropriate Reading Level	10	1	2	6	1	0	3	0	7
Appropriate Technical Level	10	1	2	6	1	0	3	0	7
Appropriate Interest Level	9	2	2	4	3	0	3	0	7

*Items 11, 12, and 13.

Content

Current information--item 14. The information was considered to be current for all materials except "Living With Energy" from Amoco and "Save NRG" from the American Petroleum Institute. Both of these contained outdated information on the costs of petroleum.

Alternative views--item 15. A piece of material received a positive response on this item if students were given the opportunity to explore alternatives to the expected policies of the energy company. Eight of the 13 teacher's guides received positive responses, and four received negative responses. The item was not applicable for an experiment booklet from the American Gas Association. Of the seven comic books evaluated, one received a positive response, three received a negative response, and three had content that did not apply to this item. Ten pamphlets were evaluated; five positively and five negatively. This item did not apply to five of the other materials, primarily because the content was on safety or how energy is used. Both Edison experiment booklets were rated positively on this item.

Promotion of products, policies, or points of view--item 16. In order to receive a positive rating on this item, the material needed to be free of blatant brand-name advertising. Policies and points of view considered advantageous to the industries had to have been counter-balanced with opposing viewpoints which students could discern. With four exceptions, all of the materials evaluated were judged to be free of overt promotion of the company's product, policy, or point of view. Three of the four materials that received negative responses were comic books produced by Culver, and the other was a Bete pamphlet.

Fair treatment of topical issues--item 17. A topical issue is one in which there may be no right or wrong answer but only opinion. (Example of topical issues are environment and energy production, price controls, nuclear power, etc.) Eight of the materials received negative responses on this item because of their lack of objectivity on the leasing of government lands for oil exploration and petroleum price controls. The remainder of the materials received a "2" (mildly positive) rating. Most seemed to be making efforts to present alternative opinions on topical issues.

The Content category is summarized in Table III.

TABLE III
SUMMARY OF EVALUATION RESULTS FOR ITEMS
HAVING TO DO WITH CONTENT*

	Teacher's Guides with Student Materials			Comic Books			Pamphlets		
	Pos.	Neg.	NA	Pos.	Neg.	NA	Pos.	Neg.	NA
Current Information	12	1	0	7	0	0	9	1	0
Alternative Views	8	4	1	1	3	3	5	5	0
Promotion of Products, Policies or Points of View	13	0	0	4	3	0	9	1	0
Fair Treatment of Topical Issues	10	2	1	2	2	3	4	4	2

*Items 14, 15, 16, and 17.

Utilization Characteristics

Specific discipline correlation--item 18. Although most of the materials received either a three or four (negative responses) on this item, this should not necessarily be perceived as a criticism of the material. Secondary level materials tend to correlate with specific disciplines while elementary materials do not. For example, an experiment booklet from the American Gas Association was designed for secondary science classes while a National Coal Association unit for K-3 had no designated subject area. However, only five of the materials seemed to be aimed at a particular discipline.

Special conditions--item 19. Like item 18, responses of three or four do not necessarily mean a criticism of the material. All the teacher's guides and accompanying student materials required some special conditions for their use. Special conditions were usually library materials or duplicating machines. The comic books and pamphlets did not require any special conditions, but the experiment booklets needed science equipment.

A summary of the Utilization Characteristics is presented in Table IV.

TABLE IV
SUMMARY OF EVALUATION RESULTS FOR ITEMS HAVING TO
DO WITH UTILIZATION CHARACTERISTICS*

	Teacher's Guides with Student Materials		Comic Books		Pamphlets	
	Yes	No	Yes	No	Yes	No
Specific Discipline Correlation	3	10	0	7	0	10
Special Conditions	12	1	0	7	0	10

*Items 18 and 19.

Presentation of Materials

Clearly outlined procedures--item 20. Procedures were considered clearly outlined if they gave directions for the use of the material. This item was considered not applicable to any of the comic books or pamphlets. The remainder of the materials were given positive responses.

Sample activities or questions--item 21. Four of the 13 teacher's guides evaluated did not have adequate sample activities or study questions. None of the remainder of the materials, including comic books or pamphlets, had study questions.

Intended use--item 22. All but two of the 37 materials received positive responses to this item. "The Power of Coal" produced by the National Coal Association and "Facts About Oil" by the American Petroleum Institute received negative responses because the lesson plans did not give specific instructions for the use of the materials.

Production quality--item 23. The overall quality of the material was good with the exception of some of the Culver comic books and one student workbook produced by Philadelphia Electric.

Table V presents a summary of the evaluation results for the Presentation of Materials category.

Evaluation

Evaluation of student outcomes--item 24. Nine of the teacher's guides with student materials provided a way to evaluate student outcomes, but none of the comic books, pamphlets, games, experiment booklets, and only one of the coloring books did. So only 10 of the 37 materials provided for measurement of student learning.

TABLE V
SUMMARY OF EVALUATION RESULTS FOR ITEMS HAVING
TO DO WITH PRESENTATION OF MATERIALS*

	Teacher's Guides with Student Materials			Comic Books			Pamphlets		
	Pos.	Neg.	NA	Pos.	Neg.	NA	Pos.	Neg.	NA
Clearly Outlined Procedures	13	0	0	0	0	7	0	0	10
Sample Activities or Questions	9	4	0	0	7	0	0	10	0
Intended Use	11	2	0	7	0	0	10	0	0
Production Quality	12	1	0	4	3	0	10	0	0

*Items 20, 21, 22, and 23.

Teacher feedback--item 25. Only three of the entire 37 materials provided a means for teachers to inform the company about the materials' usefulness. The three were "The Energy Crisis" and "Living With Energy" both produced by Amoco and the unit produced by the National Coal Association.

The Evaluation category is summarized in Table VI.

TABLE VI
SUMMARY OF EVALUATION RESULTS FOR ITEMS HAVING
TO DO WITH EVALUATION*

	Teacher's Guides with Student Materials			Comic Books			Pamphlets		
	Pos.	Neg.	NA	Pos.	Neg.	NA	Pos.	Neg.	NA
Evaluation of Student Outcomes	9	4	0	0	7	0	0	10	0
Teacher Feedback	3	10	0	0	7	0	0	10	0

*Items 24 and 25.

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

Summary

This study was undertaken in order to provide a listing of available energy education materials as well as to determine possible biases. Three questions were deemed important to this study: Are materials available? Are the materials biased? and Can the materials contribute to the teaching curriculum?

The review of selected literature revealed that there is a need for energy education, especially as it applies to students' attitudes and values. There is disagreement about who should produce energy materials. Some energy education materials have been formally evaluated, but little evaluation of industry-produced energy material has been done.

Recipients of letters requesting packets of materials were selected using Fortune (1980, 1981) magazine's lists and the Encyclopedia of Associations (1981). An Evaluation Guide was designed and tested for use in this study. Thirty-seven sets of materials were collected and evaluated by the investigator.

Results of the collection indicated that there are many energy education materials available. Of the 96 letters sent requesting materials, 46 responses were received; 33 respondents sent materials. Utilities had the highest level of response

(60 percent), and industries and associations responded to a lesser degree (20 percent).

The majority of the materials were produced within the last five years. Thirteen teacher's guides with student materials (workbooks, spirit masters), seven comic books, ten pamphlets, and seven other types of materials were evaluated. Most of the evaluated materials were supplementary and did not recommend other resources. The teacher's guides usually stated intended grade levels, but the remainder of the materials did not.

The results of the materials' evaluations showed that most teacher's guides with student materials had realistic and attainable objectives. Other types of materials usually did not have objectives.

Reading, technical, and interest levels tended to relate to stated grade levels. Grade level information could be inferred for most materials without stated grade levels.

With a few exceptions, the materials contained current information. Approximately half of the materials did not contain information which offered the student an opportunity to learn of opposing viewpoints. The materials tended to be free of blatant advertising and promotion of company policies. Topical issues were treated fairly in most of the materials. Some materials had content that did not apply to these points.

Most of the materials were not designed for a particular subject area. The teacher's guides required some special conditions, but the comic books and pamphlets did not.

Instructional guidelines were clear for those materials requiring them, but the majority of the materials did not have study questions. The intended use was generally understood, and the production quality of the material was good.

About two thirds of the teacher's guides provided for measuring student outcomes, but none of the other materials did. Very few of the materials encouraged teachers to inform the company about the material's usefulness.

Conclusions

The general purpose of this study was to identify and evaluate industry-produced energy education materials. Three questions were judged to be important to this study, and they are each discussed based on the results of collecting and evaluating the materials.

Question 1. What energy education materials are available from energy industries, utilities, and trade associations? Since approximately two-thirds of the respondents were utilities, it was concluded that local utilities, along with the largest energy companies and their associations, were the most likely sources of materials.

Question 2. To what extent do curriculum materials produced by energy industries, utilities, and trade associations show a bias for their products or points of view? One measure of bias for their products or points of view is whether the materials present sufficient alternative views. Although half of the materials reviewed received a positive response to the item concerned with alternative views, these

positive responses were mostly two's (agree partially). Overall then, industries', utilities', and trade associations' materials did not present sufficient alternatives to their company policies. Another measure of bias is whether the materials promote company products, policies, or points of view. Over half of the materials received responses of one (agree completely) on the item dealing with promotion of company products, policies, or points of view, indicating that industry-produced materials evaluated are relatively free of this promotion. A third measure of bias is whether the materials treated topical issues fairly. Most of the materials treated topical issues fairly and received positive responses. However, the few that did not could easily make teachers wary of industry-produced materials. Since alternative views can be presented in the classroom using other materials, it was concluded that most of the materials handled controversial subjects fairly well and were not overtly biased.

Question 3. To what extent can industry sponsored materials properly contribute to a teacher's energy education resources? There are a variety of materials available, and most of them are free and easy to obtain. The majority of the materials received and evaluated were considered to be supplementary indicating that the design of energy units is being left up to the teacher or that units are available elsewhere. Since grade level, objectives, and study questions were not available for many of the materials, they could be more difficult to use. With careful screening by teachers, industry-produced materials could contribute variety and different perspectives to teachers' energy education resources.

Implications

Several implications for future development of energy materials by industries, utilities, and trade associations can be made based on the results of this study. First of all, several of the problems with the materials, i.e., lack of grade level, objectives, and study questions, could be alleviated if the organizations developing the materials used classroom teachers as developers. Also, if the materials were field tested, even informally, using a device similar to the Evaluation Guide used in this study, many of the problems could be corrected before the materials were generally distributed. Teachers should be encouraged to continue to evaluate and respond to the materials by the inclusion of a simple post card-type device.

Secondly, companies developing materials need to better deal with controversial energy issues. The materials should carefully lay out all the alternatives. If the energy industries', utilities', or associations' point of view is accurate, then it will stand up to scrutiny.

Thirdly, companies will find that if they omit figures and prices, their materials will be current for longer periods of time. Otherwise, the materials should be updated every two or three years.

Lastly, teachers need to take greater responsibility when planning to use industry-produced energy education materials. The content of the materials should be carefully previewed before it is presented to students.

Recommendations for Further Study

1. An evaluation of the major energy curriculum projects now available needs to be done. Examples are "Energex," "Energy and Man's Environment," "Aunt Energina," and "Energy 80" (See Chapter IV).
2. Energy materials from industries and organizations other than those which met the criteria for this study need to be identified, collected, and evaluated. Companies such as McDonalds, organizations such as the Center of Appropriate Technology, and many school systems also produce energy materials.
3. A content analysis of the energy materials used in this study was not done but it would contribute valuable information on energy education materials. This information is needed to help teachers select and use supplementary energy education materials.

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APPENDICES

APPENDIX A

EVALUATION GUIDE

1. Title of material _____
2. Date produced (if available) _____
3. Sponsor (name of organization) _____
4. Type of material: Teacher's guide _____, Student Worksheet _____,
Spirit masters _____, Comic book _____, Pamphlet _____,
Poster _____, Other _____
5. The material is a complete unit _____; supplementary _____
6. Supplementary resources are suggested: Yes _____ No _____
7. Intended grade level (if available) _____

Instructions for use: Use the following scale for evaluating the material. Each of the descriptive statements is followed by a scale. Indicate your assessment of the material by circling the appropriate number on the scale.

- | | |
|------------------------|--------------------------------------|
| (1) Agree completely | (4) Disagree completely |
| (2) Agree partially | (NA) Not applicable to this material |
| (3) Disagree partially | |

Objectives

Scale

- | | | | | | |
|---|---|---|---|---|----|
| 8. Objectives are clearly stated. | 1 | 2 | 3 | 4 | NA |
| 9. The stated objectives are realistic. | 1 | 2 | 3 | 4 | NA |
| 10. Identified objectives may be reached through use of the material. | 1 | 2 | 3 | 4 | NA |

Abilities

- | | | | | | |
|--|---|---|---|---|----|
| 11. The reading level is appropriate for the intended grade level. | 1 | 2 | 3 | 4 | NA |
| 12. The technical level is appropriate for the intended grade level. | 1 | 2 | 3 | 4 | NA |
| 13. The interest level is appropriate for the intended grade level. | 1 | 2 | 3 | 4 | NA |

Content

- | | | | | | |
|--|---|---|---|---|----|
| 14. The information is current. | 1 | 2 | 3 | 4 | NA |
| 15. Alternative views are given. | 1 | 2 | 3 | 4 | NA |
| 16. The material is not trying to promote products,
agency policies, or political points of view. | 1 | 2 | 3 | 4 | NA |
| 17. The material treats topical issues fairly and
honestly and does not advocate any one
particular point of view. | 1 | 2 | 3 | 4 | NA |

Utilization Characteristics

- | | | | | | |
|---|---|---|---|---|----|
| 18. The material correlates with a specific
discipline area. | 1 | 2 | 3 | 4 | NA |
| 19. The material demands special conditions for use. | 1 | 2 | 3 | 4 | NA |

Presentation of Materials

- | | | | | | |
|---|---|---|---|---|----|
| 20. Instructional procedures are clearly outlined. | 1 | 2 | 3 | 4 | NA |
| 21. Sample student activities and/or study
questions are included. | 1 | 2 | 3 | 4 | NA |
| 22. The intended use is easily understood. | 1 | 2 | 3 | 4 | NA |
| 23. The production quality of the materials is good. | 1 | 2 | 3 | 4 | NA |

Evaluation

- | | | | | | |
|--|---|---|---|---|----|
| 24. The material provides for evaluation of
student outcomes. | 1 | 2 | 3 | 4 | NA |
| 25. The material provides for teacher feedback. | 1 | 2 | 3 | 4 | NA |

APPENDIX B

ENERGY INDUSTRIES AS LISTED IN

FORTUNE'S 500

**Exxon Company
Mobil Oil Corporation
**Tenneco, Incorporated
**Texaco
**Standard Oil of California (Chevron)
**Sun Petroleum Products Company
**Gulf Oil Corporation
**Standard Oil of Indiana (Amoco)
Atlantic Richfield Company
**Shell Oil Company
**Continental Oil Company
**Phillips Petroleum Company
Occidental Petroleum Corporation
*Standard Oil of Ohio
*Getty Oil Company
Union Oil Company of California
Marathon Oil Company
Ashland Oil, Incorporated
Amerada Hess Corporation
Cities Service Company
Allied Chemical Company
Coastal States Gas Producing Company
Farmland Industries, Incorporated
Charter International Oil Company
*Kerr-McGee Chemical Corporation
Diamond Shamrock Corporation
*Agway Incorporated
Pennzoil Company
*Tosco Corporation
*American Petrofina, Incorporated
Murphy Oil Corporation
Clark Oil and Refinin Corporation
Superior Oil Company
Commonwealth Oil Refining Company, Incorporated
St. Joe Minerals Corporation
Witco Chemical, Corporat
Texasgulf, Incorporated.
Louisiana Land and Exploration Company
*Quaker State Oil Refining Corporation
Belco Petroleum Corporation
Vulcan Materials Company
*Freeport Minerals Company

United Refining Company
*Midland Cooperatives, Incorporated
Westmoreland Coal Company
Crown Central Petroleum Corporation

- * Responded to the request for energy materials
- **Sent energy materials.

UTILITIES FROM FORTUNE'S 50
WHICH RECEIVED LETTERS

- **Pacific Gas and Electric
Commonwealth Edison
 - **Consolidated Edison
 - **Southern California Edison
Public Service Electric and Gas
 - **Virginia Electric and Power
*Texas Utilities
 - **Duke Power
 - **Consumers Power
 - **Philadelphia Electric
 - **Detroit Edison
 - **Florida Power and Light
United Telecommunications
 - **Houston Industries
 - **Pennsylvania Power and Light
Carolina Power and Light
El Paso
 - **Niagara Mohawk Power
Long Island Lighting
 - **Ohio Edison
Northeast Utilities
 - **Union Electric
Pacific Power and Light
 - **Baltimore Gas and Electric
Transco Companies
Cleveland Electric
Panhandle Eastern Pipe Line
 - **Northern States Power
 - **Arizona Public Service
Gulf States Utilities
Public Service Company of Indiana
 - **Northern Indiana Public Service
 - **Potomac Electric Power
 - **Duquesne Light
Cleveland Electric Illuminating
- * Responded to the request for energy materials.
**Sent energy materials.

TRADE ASSOCIATIONS WHICH
RECEIVED LETTERS

- **National Coal Association
 - National Independent Coal Operators Association
 - Pittsburgh Coal Mining Institute of America
 - *Rocky Mountain Coal Mining Institute
 - Southern Coal Producers Association
 - Edison Electric Institute
 - National Rural Electric Cooperative Association
 - Institute of Gas Technology
 - National Alcohol Fuels Producers Association
 - Wood Energy Institute
 - **American Gas Association
 - *American Mining Congress
 - *Colorado Mining Association
 - **American Petroleum Institute
 - *Independent Petroleum Association of America
- * Responded to the request for energy materials.
**Sent energy materials.

APPENDIX C

Date

Dear Sir:

As a science educator concerned about our energy situation, I am interested in available energy education materials and resources for elementary and secondary levels. Many companies also share this concern about energy and are producing quality materials to be used by teachers in the classroom. If your company is one of these, would you please send me copies of the educational materials you produce for these levels? Please forward them to the address below.

Thank you for your assistance.

Sincerely,

Janice K. Kell
8708 Longmeade Drive
Knoxville, TN 37923

APPENDIX D

MATERIALS EVALUATED

Teacher Guides with Student Materials

- "The Power of Coal" - National Coal Association
- "The Energy Crisis" - Amoco
- "Living With Energy" - Amoco
- "Save The Dinosaurs" - Chevron
- "Facts About Oil" - American Petroleum Institute
- "Discovering Coal" - National Coal Association
- "Science Principles and Gas Appliances" - American Gas Association
- "Energy Learning Center" - Chevron
- "Something Special for Teachers" - Tenneco
- "Energy Conservation in Our Homes" - Pennsylvania Power and Light
- "The Story Behind Your Light Switch" - Houston Lighting and Power
- "Energy in Our Society" - Philadelphia Electric
- "Our World of Energy" - Philadelphia Electric

Comic Books

- "Mickey Mouse and Goofy Explore Energy" - Exxon, Consolidated Edison
- "Energy--Why We Must Conserve It Now" - Duquesne Lighting, Duke Power, Potomac Power, Consumers Power
- "Safety Around Electricity" - Duquesne Lighting, Niagara Mohawk, Virginia Power, Consumers Power
- "The Story of Electricity" - Duquesne Lighting, Niagara Mohawk, Potomac Power, Duke Power, Detroit Edison
- "Electric Safety from A to Zap" - Duke Power, Virginia Power, Potomac Power, Niagara Mohawk, Consumers Power
- "Mr. Edison's Dilemma" - Consolidated Edison, Potomac Power, Niagara Mohawk, Consumers Power, Union Electric
- "Where the Little Light Bulb Gets It Juice" - Consolidated Edison, Virginia Power, Florida Power, Potomac Power

Pamphlets

- "The Energy Independence Book" - Shell Oil
- "An Eagle Eye on Energy" - Gulf Oil
- "What Happens When You Turn On The Gas?" - American Gas Association
- "Save NRG" - American Petroleum Institute
- "The ABC's of Oil" - Phillips
- "Energy for Today and Tomorrow" - Gulf Oil, Sun Petroleum, Texaco Ohio Edison, Northern Indiana
- "About Solar Energy" - Gulf Oil, Texaco, Virginia Power, Potomac Power, Detroit Edison, Florida Power, Union Electric
- "Edison--The Man Who Turned Darkness into Light" - Potomac Power, Virginia Power, Duke Power, Ohio Edison, Detroit Edison, Florida Power

"How To Conserve Energy at Home" - Phillips Petroleum, Gulf Oil,
Texaco, Potomac Power

"The ABC's of Electricity" - Virginia Power, Potomac Power, Ohio
Edison, Union Electric

Other Types of Materials*

"Electric Safety from A to Zap" - Duke Power, Virginia Power
Consumers Power, Potomac Power, Niagara Mohawk

"Color Me Safe" - Northern States Power

"Learn About Wise Use of Energy" - Baltimore Gas and Electric

"Alternative Energy Sources--Experiments You Can Do" - Duke Power,
Detroit Edison, Florida Power, Potomac Power, Northern States
Power, Union Electric, Niagara Mohawk, Consolidated Edison

"Energy Conservation--Experiments You Can Do" - Duke Power, Detroit
Edison, Florida Power, Potomac Power, Consolidated Edison,
Niagara Mohawk, Union Electric, Northern States Power

"Energee" - Duke Power

"Waste Not--Want Not" - Potomac Power

*Coloring Books, Experiment Booklets, Games and Posters.

VITA

Janice K. Kell (nee Lowe) was born in Casper, Wyoming, on September 12, 1946. She attended local schools, graduating from Natrona County High School in June 1964. The following September she entered Casper College. After transferring to the University of Wyoming in September of 1966, she received a Bachelor of Science degree in August, 1969.

In the fall of 1969 she accepted a teaching position in Prince George's County, Maryland. After five years of teaching biology and serving as Science department chairperson at Gwynn Park Senior High School, she moved to Colorado to teach biology and life science at Pecos Junior High School in Northglenn.

After moving to Knoxville, Tennessee, in 1978, Ms. Kell began working for the American Museum of Science and Energy in Oak Ridge. While working at the Museum, she began graduate study at the University of Tennessee, Knoxville, in the fall of 1979. From July 1980 to February 1981 she worked for the Energy Education Program in Knoxville and since then has been employed as an Energy Education Specialist with the Tennessee Energy Education Network, a program of the Tennessee Energy Authority. Ms. Kell received the Master of Science degree in science education in December 1981.

She is a member of Phi Delta Kappa and the National Science Teachers Association.

She is married to Robert A. Kell, an attorney with TVA.