energy center

Program Evaluation

188-1

K-12 Energy Education Program Baseline Study

An Evaluation of Teacher Practices and Student and Parent Learning

June 1999

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ABSTRACT

This report is the first part of an evaluation of the K-12 Energy Education Program (KEEP). The purpose of the project is to 1) establish a benchmark of how energy is currently being taught in Wisconsin schools, and 2) measure students' and parents' knowledge of the four KEEP themes and current attitudes and practices regarding energy consumption. The measurements were made using surveys, which were administered in February and March of 1998. The results will be used to measure the effect of KEEP on the attitudes, behaviors, and learning among students and their families.

Report Summary

Project Background

The Wisconsin K-12 Energy Education Program (KEEP) was created in 1993 to help promote energy education in Wisconsin. The ultimate goal of KEEP is to provide the knowledge and skills necessary to help future energy consumers in Wisconsin make informed decisions about energy use. The two major tools of the program are the *Energy Education Conceptual Framework and Suggested Scope and Sequence* and the *Energy Education Activity Guide.* The conceptual framework of KEEP divides energy education into four themes that build upon each other: Theme I: We Need Energy; Theme II: Developing Energy Resources; Theme III: Effects of Energy Resource Development; and Theme IV: Managing Energy Resource Use.

The Energy Center of Wisconsin funds KEEP. As part of this task, the Center is evaluating how effectively the KEEP approach ultimately affects learning, attitudes, and behavior among students and their families. This report summarizes the results of the first phase of the evaluation: to collect baseline data on the current status of energy education in Wisconsin's public schools before the KEEP program is implemented. The findings of the baseline study measure (1) how teachers are currently teaching energy in Wisconsin schools, and (2) students' and parents' knowledge of the four KEEP energy themes and their attitudes/practices regarding energy usage.

Methods

The target population for the baseline survey was restricted to students enrolled in Wisconsin public schools in grades 4 through 12 and their teachers.

Teachers. Science, mathematics, social studies, language arts, technology education, family living and consumer education teachers in grades 4 – 12 were selected as the target population. A database of all staff working in the Wisconsin K-12 Public School System during the 1997 – 1998 school year was obtained from the Department of Public Instruction. A random sample of 500 was selected from a sample frame of 14,741 teachers. A total of 283 surveys were completed by teachers representing a response rate of 58 percent. Based on a comparison analysis, the characteristics of the respondents were determined to be representative of the target population.

Students and Parents. The 428 school districts in Wisconsin were each placed into one of four school-size strata. Each strata had approximately equal numbers (150,000) of 4^{th} – 12^{th} graders. Districts were randomly sampled out of each strata. Because the surveys were conducted in person, districts that were considered to be geographic outliers were eliminated from the sample. A total of 21 districts were selected for the study (approximately 88 students per grade).

Two versions of the 12-page survey were used—one for 4^{th} – 6^{th} graders and one for 7^{th} – 12^{th} graders. Research analysts from Hagler Bailly administered the survey to students in the classroom. Depending on the grade level, slightly different procedures were used to administer the survey. For all grades, the research analyst gave a short introduction to the survey and was available to answer questions during the survey administration. All students participating in the survey were also given a 12-page booklet for their parents to complete. The parent survey was very similar in design to the 7^{th} – 12^{th} grade booklet. A total of 819 students and 421 parents completed surveys.

FINDINGS

WHAT ARE STUDENTS LEARNING?

- Three-quarters of the students have studied at least one of the KEEP themes.
- Most learned about energy in a science class.
- When quizzed about their specific energy knowledge, students scored an average of 50 percent overall. They scored the highest on Theme IV: Managing Energy Resource Use (62%) and the lowest on Theme II (Developing Energy Resources) (45%).

Although the baseline study was not designed to determine the causal relationship between students' energy knowledge and their energy-related behavior, the data were examined to assess the strength of this relationship.

- Students with higher energy knowledge scores were more willing to take energy conservation actions, to report having taken such an action in the past, and to have more positive attitudes toward energy conservation and education.

One plausible hypothesis for this finding is that increased energy knowledge may lead to an increase in positive attitudes and commitment to energy conservation behavior. However, the reader should keep in mind that while the differences between students with high versus low energy scores were statistically significant (based on a 95% confidence interval), factors outside the scope of the baseline study could also have contributed to this relationship.

WHO IS TEACHING ENERGY?

A majority of Wisconsin teachers in the target population already infuse the subject of energy into their classroom curriculum.

- Even though most students learn about energy concepts and topics in at least one class, a large proportion of teachers (47%) in the target population do not currently teach their students about energy. Energy teachers have the following characteristics:
  - They are more likely to teach science or technical education and to also teach in rural schools.
  - Compared to non-energy teachers, energy teachers tend to use a greater range of teaching materials, including the Internet, videos, and novels.
  - 67 percent of the classes where energy is taught are at the high school level.
  - The majority of energy teachers (62% or more) teach each of the four KEEP energy themes, with Theme IV (Managing Energy Resource Use) being taught by the most teachers (69%).

Non-energy teachers named two factors that would influence them to include energy issues in their curriculum:

- Better access to resources and aids for teaching about energy
- More in-service classes on energy education teaching methods

WHAT ROLE DO PARENTS PLAY?

- Parents achieved an average of 60 percent correct responses across all KEEP energy themes. They were most knowledgeable about Theme IV (Managing Energy Resource Use). Differences on willingness to conserve, commitment to conservation, and energy attitudes were only marginally significant between higher- and lower-scoring parents.
- Even though the relationship is not as strong as for students, the data show that willingness to conserve, commitment to conservation, and positive attitudes toward energy-related issues all tend to be higher among parents with higher knowledge scores.

These two findings suggest that if KEEP is successful at increasing energy knowledge throughout the state by reaching parents through their student children, it could lead to increased energy conservation actions and support for energy education programs.

The relationship between parents' energy knowledge and their child's energy knowledge and behaviors.

- Students whose parents' energy knowledge was high were more likely to have higher energy knowledge scores themselves. This correlation was statistically significant.

- In addition, children whose parents had a high overall energy knowledge score (70% or higher) were more likely to say they had **actually performed energy** conservation actions compared to children whose parents had lower scores. However, the differences between these same students' willingness to conserve energy and overall energy attitudes were only marginally significant.

Parental support and household activities can be used to make energy education more effective.

- Nearly all parents who completed a baseline survey support energy education for their children. Compared to students, parents also consistently report higher energy knowledge scores, more positive attitudes toward energy and resource conservation, and higher levels of actual conservation behaviors.

Energy education programs could capitalize on this strong base of parental support and current household energy conservation activities to increase students' awareness and enthusiasm for energy topics and concepts. Energy education activities that increase student awareness of their parents' attitudes and the energy conservation activities that occur in their household will serve to strengthen their own commitment to energy conservation. Especially for younger students, awareness of their parents' support for energy conservation will make them more willing to talk to other students about energy topics and the need to conserve and use energy wisely. For older students, energy education activities that involve studying their own household behaviors may influence parents and other family members to explore other behaviors that reduce energy consumption or increase energy efficiency.

WHO IS INTERESTED IN AN ENERGY EDUCATION PROGRAM?

- *Parents.* Almost all of the parents (99%) said they would find value in activities at school that taught their child what energy is, how it is used, and ways in which energy use affects the environment.

- *Students.* Seventy-four percent of students responded positively to these types of energy activities.

- *Teachers*. In contrast to parents' and students' interest in energy activities, less than a third of the teachers (30%) were very interested in attending a training for an energy education program. The general characteristics of interested teachers are summarized below.

- Interested teachers were slightly more likely to teach in a rural setting (40% compared to 33%).

- Not surprisingly, science teachers (47%) were the most interested in attending energy education training.

- Teachers who are currently including the topic of energy in their classroom curriculum are more likely to be interested in the training (78% compared to 42%).

- The majority of interested teachers use a variety of teaching materials such as videos (95%), magazine articles (77%), newspaper articles (71%), activity guides (68%), and the Internet.

WHAT CAN BE DONE TO HELP PROMOTE KEEP?

Based on the results of the baseline survey, several recommendations can be made to help KEEP reach the largest audience of people:

- Science teachers in rural areas are the best target for the KEEP program. They are the most interested in the program and already teach some energy-related activities. Therefore, they will be the easiest teachers to reach in the short term.

- Non-science teachers are less likely to be interested in KEEP and currently do not include energy-related activities in their curricula. One of the barriers to teaching energy is that these teachers feel energy is not appropriate for their subject matter. KEEP promotional materials need to appeal to a wide audience and convince non-science teachers that the KEEP energy activities can complement their current lesson plans.

- The two things that would have the largest influence on non-energy teachers including energy in their curricula would be better access to resources and aids for teaching about energy and more in-service classes on energy education teaching methods. KEEP does just that. Marketing efforts should be increased so more teachers are aware of the benefits of KEEP.

- The majority of parents and students support energy education. If school district administrators were aware of this, they might agree to schedule a KEEP in-service at one of their schools. This would allow a large number of teachers to have easy access to KEEP training.

- The data suggest that increased energy knowledge may increase the level of energy conservation behaviors among students. Groups that are interested in promoting energy conservation behavior may be interested in helping promote KEEP as well.

- The data also suggest that students with high knowledge scores tend to have parents with high knowledge scores. An ancillary program that included some adult education activities is a possible next step for KEEP to increase the overall effect of the program on Wisconsin students.

CHAPTER 1
INTRODUCTION

1.1 PROGRAM BACKGROUND

The Wisconsin K-12 Energy Education Program (KEEP) was created to help promote energy education in Wisconsin. Initially in 1993, the Wisconsin Center for Environmental Education (WCEE) proposed that a comprehensive guide to K-12 energy education in Wisconsin be developed. In 1995, the Energy Center of Wisconsin, a nonprofit energy-efficiency research organization based in Madison, agreed to fund the project. The Wisconsin Environmental Education Board and the University of Wisconsin-Stevens Point also provide support for KEEP.

1.1.1 Program Goals and Objectives

The mission statement of KEEP is "to initiate and facilitate the development, dissemination, implementation, and evaluation of energy education programs within Wisconsin schools." The ultimate goal of KEEP is to provide the knowledge and skills necessary to help future energy consumers in Wisconsin make informed decisions about energy use. In theory, these consumer decisions will reflect both customers' and society's needs to use fuel, plant capacity, and natural resources efficiently. In order to facilitate this goal, KEEP will provide elementary, middle, and high school teachers with a usable and useful energy curriculum and framework through the development and dissemination of the *Energy Education Conceptual Framework and Suggested Scope and Sequence* and the *Energy Education Activity Guide.*

1.1.2 The Conceptual Framework

The conceptual framework provides the structure for the K-12 Energy Education Program. The framework provides concepts that address a variety of different issues and viewpoints. These concepts were derived from energy-related frameworks designed by other educational organizations (National Energy Foundation, 1988; North American Association for Environmental Education, 1990) and from physical and environmental science texts. The conceptual framework divides energy education into four themes that are arranged so they build upon each other. The information in the first theme lends understanding to concepts in the second theme, and so forth.

- **Theme I: We Need Energy** defines energy, describes how energy is transferred and converted from one form to another according to the laws of thermodynamics, and explains how energy flows through living and nonliving systems.

- **Theme II: Developing Energy Resources** addresses the sources of energy and how humans, through technology, use energy to meet societal wants and needs. It also shows how humans have come to treat energy as a resource.
- **Theme III: Effects of Energy Resource Development** discusses how using energy resources affects human societies and the environment.
- **Theme IV: Managing Energy Resource Use** identifies strategies to help resolve many of the issues presented in the third theme. In addition, this theme discusses how today's energy-related decisions and actions influence the future availability of energy resources.

The purpose of the conceptual framework is to (1) identify and present concepts that can help people understand energy and make decisions about energy issues, (2) provide guidance for teachers to incorporate energy education into their curricula, and (3) direct the development of the *Energy Education Activity Guide*.

1.1.3 The Energy Education Activity Guide

The centerpiece of KEEP is the *Energy Education Activity Guide*, which helps make energy understandable to students of all ages. Organized by the four themes outlined above, the Guide includes more than 40 activities that demonstrate important energy concepts, including energy generation, its effects in our world, and how to best manage its use.

Teachers can receive the *Energy Education Activity Guide* by taking a free one-credit graduate inservice conducted by the Center that provides them with hands-on experience implementing KEEP in the classroom.

1.2 ORGANIZATION OF THE REPORT

The remainder of this chapter discusses the KEEP evaluation and the data collection methodology. Chapter 2 presents the results from the baseline survey with students. Parents' baseline results can be found in Chapter 3, while Chapter 4 contains a summary of the findings from the teachers' baseline study. Chapter 5 compares students and parents across several dimensions. Chapter 6 summarizes the key findings from the baseline survey. Appendix A contains information on sample selection for the teacher, student and parent surveys. Appendix B contains copies of the survey instruments used in the Baseline Study. The answer keys to the energy knowledge questions used in the student and parent surveys can be found in Appendix C. Statistical data tables of the survey results are available separately from the Energy Center.

1.3 KEEP BASELINE EVALUATION AND METHODOLOGY

The Center is evaluating how effectively the KEEP approach ultimately affects learning and promotes attitude and behavior changes for students and their families. The first phase in their evaluation effort is to collect baseline data from teachers, students, and parents on the current status of energy education in Wisconsin public schools, prior to implementation of the KEEP program. This report presents the findings from the baseline data collection activities. The findings of the baseline study will serve two purposes: (1) the results from the teacher survey will serve as a benchmark of how energy is currently being taught in Wisconsin schools, and (2) the results of the student/parent survey will be used to measure students' and parents' knowledge of the four KEEP energy themes, as well as their current attitudes and practices regarding energy consumption.

In designing the sampling strategy for this baseline study, it was important to ensure that adequate and appropriate samples of students, parents, and teachers were selected in order to produce results that could be generalized to the target populations. The sampling strategy for each population is discussed below.

Although KEEP is designed for students in the entire range of grades (K – 12), the complex process of quantitatively measuring the energy knowledge, behaviors, and actions of very young children was considered outside the scope of the baseline study. Therefore, the target population for the baseline survey was restricted to students enrolled in Wisconsin public schools in grades 4 through 12 and their teachers.

1.3.1 Teacher Sampling and Data Collection

The course content of KEEP is targeted toward teachers of science, mathematics, social studies, language arts, technology education, family living, and consumer education. Although any teacher who wants to promote energy as part of his or her environmental education curriculum can become involved in KEEP, the above subject areas were considered the target population for the baseline teacher data collection.

Teachers who taught the subject areas listed above were selected as the target population. To develop a sample frame, a database of teachers in Wisconsin public schools was obtained from the Department of Public Instruction, Center for Education Statistics. This database included all staff working in the Wisconsin K-12 Public School System during the 1997–1998 school year. For this evaluation, to facilitate comparisons with the student surveys, the sample frame was restricted to teachers of grades 4 – 12. The database from DPI includes information on the grades taught at the school where the teacher is employed but not the grades taught by the individual teacher. For example, Middle School A has classes for students in grades 5 – 8. Mr. Smith teaches 7^{th} grade at Middle School A. In the DPI database, Mr. Smith is listed as teaching at Middle School A, and the grades listed are 5 – 8. It is not possible to ascertain from the information in the database that Mr. Smith only teaches 7^{th} grade. Therefore, to ensure that the sample frame did not include K – 3 teachers, teachers working exclusively in elementary schools were eliminated.

The sample frame of teachers contained a total of 14,741 teachers in the database. From this sample frame, a random sample of 500 teachers was selected. Prior to mailing sampled teachers a survey, a letter was sent to district administrators informing them that one or more teachers in their district would be receiving a survey. A 12-page survey booklet and introductory letter were then mailed to the sample of teachers at their school address. All sampled teachers received a reminder/thank you postcard approximately one week after the survey mailing. A second survey booklet was sent to nonresponding teachers approximately three weeks after the initial survey mailing. The teacher survey was conducted from February 2, 1998 to March 23, 1998.

Teachers in the sample completed a total of 283 surveys, representing a response rate of 58 percent. The demographics of survey respondents were compared to the total target population of teachers (Appendix A). Based on that comparison, the characteristics of the respondents were determined to be representative of the target population. Therefore post-data collection weighting was not necessary.

1.3.2 Student/Parent Sampling and Data Collection

The 428 public school districts in Wisconsin vary dramatically in size. As shown in Table 1-1, 288 of the school districts have grades 4 – 12 enrollments of less than 1,100 students. The largest nine districts, on the other hand, have enrollments of 7,100 or more 4^{th} – 12^{th} grade students. The largest nine districts (only about 2% of the number of districts) account for approximately 25% of the total population of 4^{th} – 12^{th} grade students. For sampling purposes, the 428 school districts in Wisconsin were divided into four approximately equal-sized strata, based on the total number of students enrolled in grades 4 – 12. Each school district strata represents approximately 150,000 students.

Table 1-1: Distribution of Students and School Districts by Strata

	Strata I	Strata II	Strata III	Strata IV
District Student Population Range (grades 4 – 12)	7,100 or more	2,400 – 7,099	1,100 – 2,399	Less than 1,100
Total Number of Students in Strata (grades 4 – 12)	151,359	152,808	149,486	151,229
Total Number of School Districts in Strata	9	40	91	288

To complete surveys with approximately 800 students (200 from each stratum), participation from no less than four to six districts in each stratum was required. Therefore a slightly larger random sample of eight districts from each strata was initially selected. Because the surveys were conducted in person, it was not cost-effective logistically to travel to every district that was randomly sampled. Therefore, districts that were considered to be geographic outliers, based on their location in comparison to other districts in the random sample, were eliminated from the sample.

Letters were sent to each district administrator in the sample explaining the KEEP evaluation and requesting his/her agreement to participate in the study. If agreement could not be obtained from four to six of the eight selected districts in a given stratum, additional districts were randomly sampled and contacted in the same manner.

Two grade levels were randomly assigned to each of the participating districts. One school per assigned grade level was also randomly chosen from each participating district. Cooperation was high, with 60 percent of the selected districts agreeing to participate in the study. A total of 21 districts participated in the study (approximately 88 students per grade). A list of participating districts is included in Appendix A.

A 12-page survey booklet was used. Two versions of the survey booklet were prepared—one for students in grades 4 – 6 and one for students in grades 7 – 12. The district administrators and principals at the participating schools were hesitant to approve student participation in a survey that collected personal information that was not directly related to the subject of energy. Therefore, extremely limited demographic data was collected.

The surveys were administered to students in the classroom by research analysts from Hagler Bailly. The surveys were administered throughout the state from February 10, 1998, to March 25, 1998. Administration varied slightly by the grade level of the students. For example, the survey was read out loud by the research analyst or their teacher to all 4th graders, the instructions for each section were read to the fifth and sixth graders, and the students in grades 7 – 12 self-administered the survey. For all grade levels, the research analyst gave a short introduction to the survey and was available to answer questions during the survey administration. In addition to completing the surveys themselves, students participating in the survey were given a 12-page survey booklet to take home for their parents to complete. The parent survey was very similar in design to the 7^{th} – 12^{th} grade student booklet. A total of 819 students and 421 parents completed surveys. The total disposition of completed surveys by grade and strata is included in Appendix A. A copy of the survey instruments can be found in Appendix B.

1.3.3 Cluster Sampling

This research used a multi-stage cluster design. That the design was multi-stage simply means that the sample selection required several steps. Thus, to survey students in Wisconsin we first selected a sample of school districts, then samples of grade levels within districts, then samples of schools within grade levels, then samples of classes within selected schools, and finally all students within selected classes.

A cluster sample was designed to obtain a representative sample of students, to reduce survey costs, and to make the data-gathering procedure more efficient. The basic objective of a sample design is to draw elements (in these case students) from a population with some known, nonzero probability of being selected. In the simplest design, this entails single-stage sampling, or selecting elements directly from the population by using a complete list of all the elements. For this project, a cluster sampling strategy was necessary because there is no available list of all students in the state of Wisconsin. However, there is a list of school districts from which a sample can be drawn, and by working with progressively smaller units (schools within school districts, grades within schools, etc.), a representative sample of students can be obtained.

A cluster sample design is also much more economical. It is less costly to conduct a survey of elements that are in close physical proximity than elements that are dispersed over a large geographic area. Physical proximity reduces travel expenses incurred by interviewers as well as associated costs of recruitment and survey administration. The trade-off that accompanies the economies of cluster sampling is the increase in standard errors due to the decrease in independent selections in the sample. Selection of each sampling unit in a simple random sample is independent of all other selections. For cluster samples, the selection of each cluster is random and, therefore, independent, but the selection of each sampling unit is not independent. That is, the sampling units included in the sample are determined by the selection of the clusters. This results in a loss of independence of selection. The loss of independent information from each sampling unit brings a loss of precision.

Because the notion of independence is difficult, the following example may help clarify the basic idea. If 20 districts are selected at random and two schools in each district are included in the sample, not all combinations of schools have an equal chance of appearing in the sample. For example, two schools in the same district have a much better chance of appearing in the same sample than two schools in different districts. Due to geographic proximity clusters are likely to be relatively homogeneous on a variety of characteristics. To the degree that school districts are homogeneous, the result of cluster sampling is to yield less accuracy than a simple random sample of the same size. The important thing to consider is not the total sample size but the number of independent observations provided by the sample. The reason becomes apparent if the case of perfect homogeneity is considered. If school districts were completely homogeneous, we would only need to sample one student in each district, and the number of “cases” would in effect be the number of districts, a much smaller N. Therefore, we want the school districts, or clusters, to be as heterogeneous as possible. The same logic applies to our clusters of schools and classrooms; greater heterogeneity increases the efficiency of our sample.

1.3.4 Design Effects

Estimating the sampling variability for multistage samples is a complex process. In the current study the impact of increasing the standard error from cluster sampling is partially overcome by stratifying the sample by size of school district. However, a number of stages in the sample frame reduced cost and increased efficiency, but had the adverse effect of compounding the difficulty of calculating the true design effect. Specifically: 1) Some school districts, primarily in northern Wisconsin, were excluded from the sample due to travel costs; 2) If agreement could not be obtained from a sufficient number of districts within a given strata, we re-sampled with replacement; 3) Classes were not randomly selected—rather, principals or district superintendents were asked to select representative samples; 4) Clusters were chosen randomly but not with probability proportionate to size. (However, when there is little variation in cluster size, or when the probability of selection within the cluster was certainty, equal probability of selection is appropriate.) Methods designed to correct for the design effects of cluster samples cannot adequately correct for all of the stages in the sample frame. For this reason, a design effect has not been calculated for the current study.

Because we have not corrected for cluster design effects, the statistical tests in this report must be interpreted with caution. All statistical tests assume there is independence within a sample. Errors introduced by using simple-random-sampling formulas for data collected from cluster samples can be serious because simple-random-sample formulas underestimate the true standard errors. Cluster samples are less efficient than simple random samples. Put differently, a cluster sample of a given size may be equivalent in terms of efficiency to a much smaller random sample. A cluster sample of size 800 may be equivalent in efficiency to a simple random sample of 500. If simple-random-sample formulas are used with an N of 800, therefore, we are more likely to obtain significance. Instead of having significance at the .05 level, the true level is higher. For this reason, we recommend that test statistics in this report be interpreted conservatively (i.e., always at p values less than .05, or even .01).

While statistical tests of significance are affected by cluster designs, sample means and other descriptive statistics remain unbiased. Cluster sampling is simple random sampling with each sampling unit containing a number of elements. Sampling fractions may still be computed which produce unbiased samples, so that every individual in the population has an equal chance of appearing in the sample. Hence, the estimators for the population mean and total are similar to those for simple random sampling.

CHAPTER 2
ENERGY KNOWLEDGE AND ATTITUDES AMONG WISCONSIN STUDENTS

The baseline survey asked Wisconsin students what KEEP energy themes they had learned about in school, quizzed them on their current energy knowledge, and asked them to rate their interest level in learning about the four KEEP energy themes. They were also asked about their attitudes and current behavior related to environmental actions and energy education. As mentioned in Chapter 1, two different versions of the survey were used: one for the 4^{th} – 6^{th} grade students and one for the 7^{th} – 12^{th} grade students (Copies of the survey instruments can be found in Appendix B). For reasons discussed in the section on sample design, statistical tests should be evaluated conservatively, meaning the confidence interval around the estimates is wider than would be obtained using less conservative levels of statistical significance. For the smallest sample size discussed in this chapter (n = 307) the 99 percent confidence interval is ± 7.4%.

Additional data tables containing the results of the student baseline surveys by school district size strata, energy knowledge score, overall willingness to conserve energy, actual commitment to conserving energy, and overall energy attitudes are available separately from the Energy Center.

2.1 WHAT IS TAUGHT AND HOW IT IS LEARNED

One of the main objectives of the baseline study was to assess the current level of energy education in the classroom. This was accomplished by determining what KEEP energy themes students had been taught in school and then defining the ways in which students were learning about energy both in school and at home.

2.1.1 Energy Themes Learned at School

Questions about 12 energy topics that corresponded to the four KEEP energy themes were used to assess whether students had been studying these four themes in school. These questions were used to identify what students recalled studying; they did not test students' knowledge of the specific topic.

The majority of Wisconsin students (Table 2-1) have studied at least one energy topic in each of the four KEEP energy themes.

- The "Effects of Energy Resource Development" (Theme III) was the most widely recognized (95%) among Wisconsin students. Students were asked if they had studied topics from four different areas related to this theme: energy costs, air pollution, quality and safety of energy, and effects on the environment. Nearly all students (95%) reported studying one or more of these topics.

- "We Need Energy" (Theme I) was another widely recognized theme (92% of all students). To measure this theme, students were asked four different questions that addressed the properties and characteristics of energy.

- "Developing Energy Resources" (Theme II) had been studied by 75% of all students. This theme covered two types of items: (1) the different sources of energy and their advantages/disadvantages, and (2) how electric circuits, motors, and generators are used to create energy.

- "Managing Energy Resource Use" (Theme IV) had been studied by 74% of Wisconsin students. The lower grades were more likely to have studied this subject matter than the higher grades. This theme was measured by asking (1) how energy could be saved at home and in business and industry and (2) career opportunities associated with energy development and use.

Table 2-1:
Exposure to KEEP Energy Themes

	STUDIED ONE OR MORE TOPIC IN THEME		
KEEP ENERGY THEME	**% of All Students (n = 821)**	**% of 4th – 6th graders (n = 307)**	**% of 7th – 12th graders (n = 514)**
Theme I: We Need Energy	92%	96%	90%
Theme II: Developing Energy Resources	75%	74%	75%
Theme III: Effects of Energy Resource Development	95%	97%	94%
Theme IV: Managing Energy Resource Use	74%	87%	67%

Learning at least something about energy in school is the norm for Wisconsin students. Almost all (98%) of the students surveyed in the baseline study said they had learned about at least one of the 12 energy topics. Only two percent had not studied any of the 12 topics. Within the four KEEP energy themes, the proportion of students who studied each of the individual energy topics varied considerably.

Theme I — "We Need Energy" (Table 2-2). There is a wide variance in the proportion of 4^{th} – 6^{th} grade students who have studied each of the individual energy topics in Theme I. There is much less variance among 7^{th} – 12^{th} grade students.

- Most of the 4^{th} – 6^{th} graders (77%) said they had studied what energy is and where it comes from and how energy is transferred between organisms in a food chain (70%). In contrast, a much lower proportion of these younger students said they had studied the contribution of sun, wind, and water to the energy cycle (29%).

- How some energy becomes unavailable with each energy conversion was studied by almost two-thirds of 7^{th} – 12^{th} grade students (65%). Another 60 percent had learned how the sun's energy travels through organisms. In contrast, slightly less than half of these older students (48%) had studied why energy can neither be created nor destroyed.

Table 2-2:
Specific Energy Topics Studied in Theme I

	PERCENT OF STUDENTS	
ENERGY TOPICS	**4^{th} – 6^{th} Graders (n = 307)**	**7^{th} – 12^{th} Graders (n = 514)**
Theme I: We Need Energy		
4^{th} – 6^{th} Grade Version		
What energy is and where it comes from	77%	
Identifying forms of potential and kinetic energy	56%	
How energy is transferred between organisms in a food chain	70%	
The contribution of sun, wind and water to the energy cycle	29%	
7^{th} – 12^{th} Grade Version		
How much energy is stored in foods		50%
How the sun's energy travels through organisms		60%
Why energy can neither be created or destroyed		48%
How some energy becomes unavailable with each energy conversion		65%

Theme II — Developing Energy Resources (Table 2-3). The majority of Wisconsin students recall being exposed to at least one topic in this theme. The exception was 4^{th} – 6^{th} graders' knowledge of what products/materials are made from fossil fuels.

- Most of the students in grades 7 – 12 had covered the topics of the advantages and disadvantages of nuclear energy and how motors and generators are used to meet energy needs (60% and 57%, respectively). A similar proportion of students in grades 4 – 6 (60%) had studied how electric circuits work. Fewer 4^{th} – 6^{th} graders reported studying what products and materials are made from fossil fuels.

Table 2-3:
Specific Energy Topics Studied in Theme II

	PERCENT OF STUDENTS	
ENERGY TOPICS	**4^{th} – 6^{th} Graders (n = 307)**	**7^{th} – 12^{th} Graders (n = 514)**
Theme II: Developing Energy Resources		
4^{th} – 6^{th} Grade Version		
What products and materials are made from fossil fuels	39%	
How electric circuits work	60%	
7^{th} – 12^{th} Grade Version		
The advantages and disadvantages of nuclear energy		60%
How motors and generators are used to meet energy needs		57%

Theme III — Effects of Energy Resource Development (Table 2-4). Several topics in Theme II had been studied by most students, but others had been studied by only a small percentage of students.

- Most 4^{th} – 6^{th} graders had studied how to safely use electricity around the home and how energy use affects the environment (88% and 75%, respectively). In contrast, only a small percentage had studied the costs of running refrigerators and other appliances, and the pros and cons of using public versus private transportation (23% and 34%, respectively).

- How energy use affects the environment (80%), what can be done to address air pollution (71%), and the kinds of energy used at early times in history (69%) had been studied by many of the students in 7^{th} – 12^{th} grade. But only 23 percent had studied how energy prices are determined.

Table 2-4:
Specific Energy Topics Studied in Theme III

ENERGY TOPICS	PERCENT OF STUDENTS	
	4th – 6th Graders (n = 307)	**7th – 12th Graders (n = 514)**
Theme III: Effects of Energy Resource Development		
4th – 6th Grade Version		
How much it costs each year to run refrigerators and other appliances	23%	
The pros and cons of using public transportation versus private travel	34%	
How to safely use electricity around the home	88%	
How energy use affects the environment	75%	
7th – 12th Grade Version		
How energy prices are determined		23%
What can be done to address air pollution		71%
The kinds of energy used at early times in history		69%
How energy use affects the environment		80%

Theme IV — Managing Energy Resource Use (Table 2-5). Students are more familiar with the energy topics related to home energy use than they are with energy use in business and industry.

- A large majority of 4th – 6th graders had studied how to save energy in the home (86%). However, only about one-third had studied how business and industry can save energy.

- Slightly more than half of the older students had studied how solar and wind energy could be used in the home (56%). Only 36 percent of these students had learned about career opportunities associated with energy development and use.

Table 2-5: Specific Energy Topics Studied in Theme IV

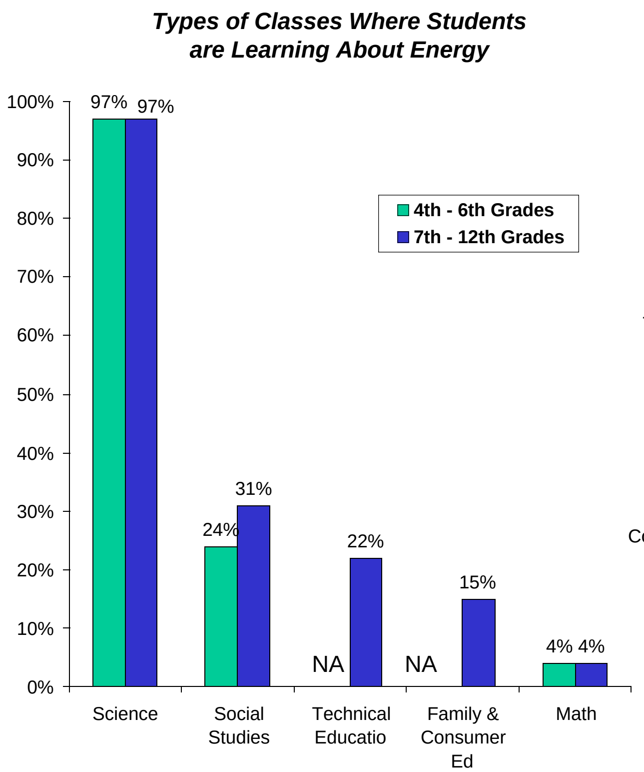
ENERGY TOPICS	PERCENT OF STUDENTS	
	4th – 6th Graders (n = 307)	**7th – 12th Graders (n = 514)**
Theme IV: Managing Energy Resource Use		
4th – 6th Grade Version		
How to save energy in your home	86%	
How business and industry can save energy	37%	
7th – 12th Grade Version		
How solar and wind energy could be used in your home		56%
Career opportunities associated with energy development and use		36%

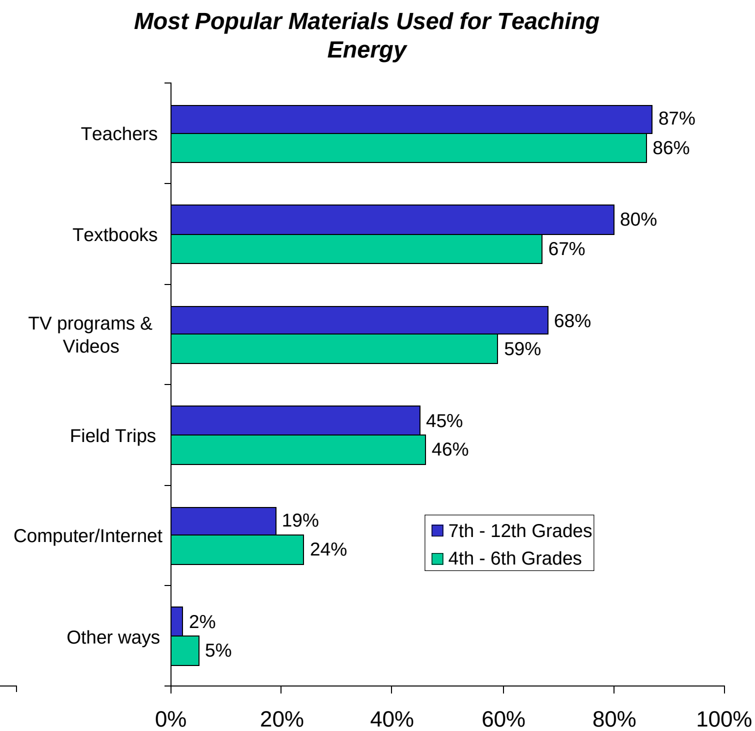
2.1.1 How Students Are Currently Learning about Energy

Students were asked in which types of classes they had learned about these energy topics and how they were taught about energy in school and at home. Currently, almost all students (97%) are learning about energy in their science class (Figure 2-1). This finding does not differ by grade level. In addition to science class, 24 percent of younger students said they learned about energy in their social studies class, and four percent learned about it in their math class. Thirty-one percent of older students learned about energy issues in their social studies class; 22 percent learned about it in a technical education class; 15 percent were exposed to energy issues in a family and consumer education class; and four percent learned about it in their math class.

While in school, most students are learning about these issues from teachers, textbooks, TV programs, and videos (Figure 2-1). Less than one-quarter of students said they used a computer or the Internet to study energy concepts or topics.

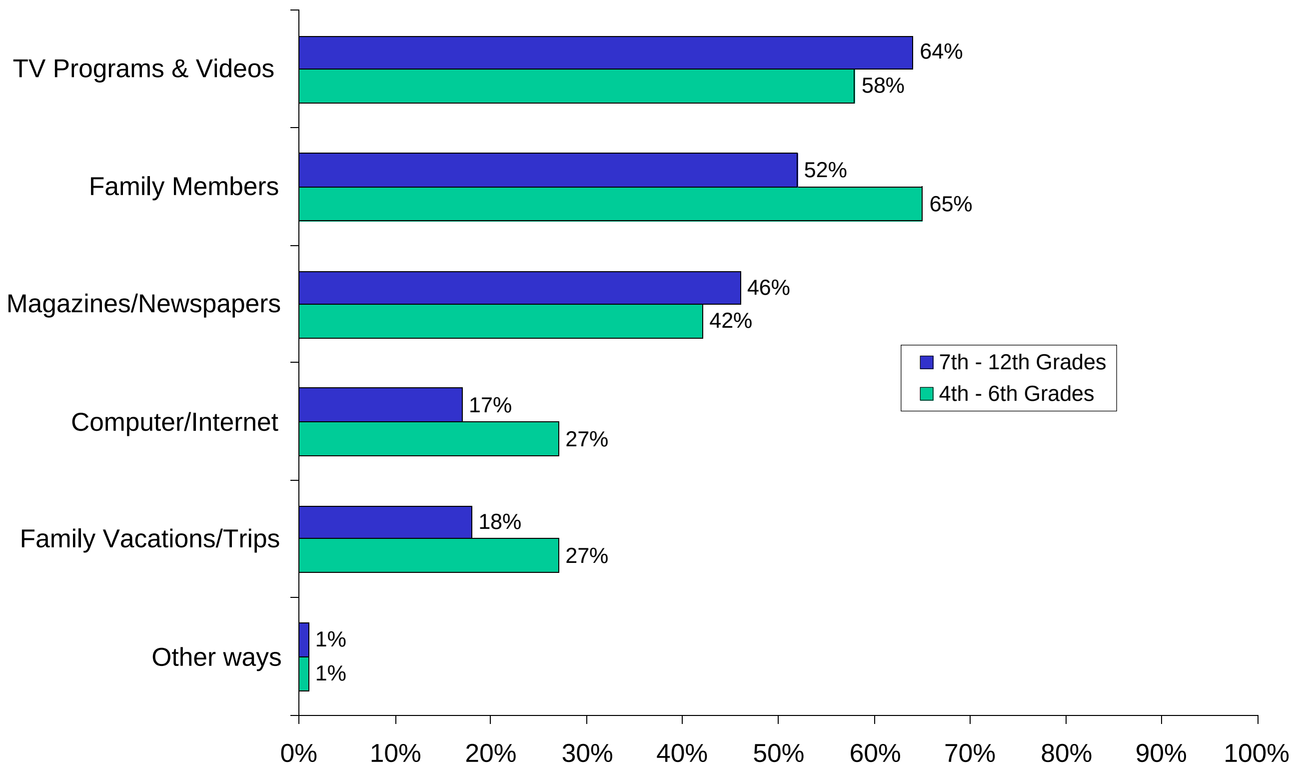
Figure 2-1:
How Students are Learning About Energy in School





Students are also learning about energy issues at home. More than half of the students reported learning about energy issues through TV programs and videos or from family members (Figure 2-2).

Figure 2-2:
How Students Are Currently Learning About Energy Issues At Home



2.2 CURRENT ENERGY KNOWLEDGE

In addition to assessing students' exposure to the four energy themes in school, students were also asked about their general knowledge of energy issues. Twenty-four multiple-choice questions were used to assess the current level of energy knowledge among Wisconsin students. Each of the 24 knowledge questions was selected to correspond to one of the four KEEP energy themes.

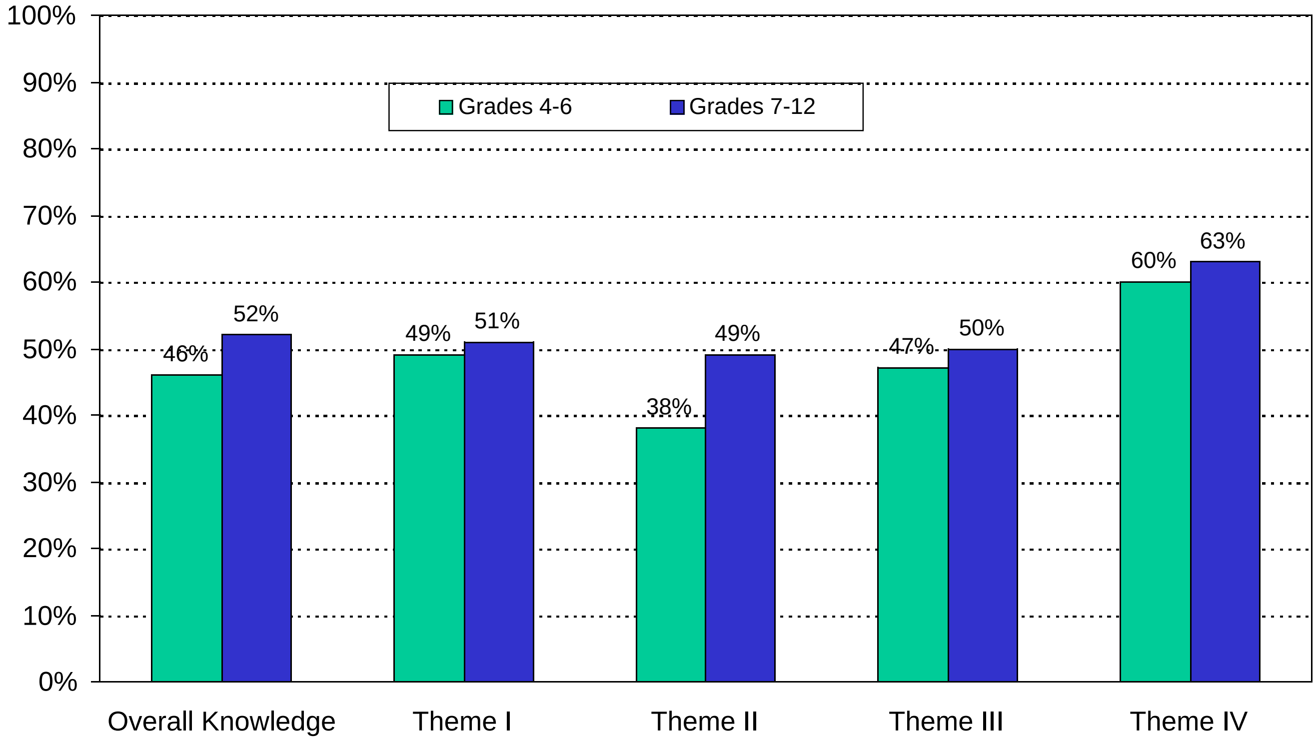
When used to measure energy knowledge, the multiple-choice format has some limitations. If respondents have four answer choices and do not know the answer, they have a 25 percent chance of selecting the correct one simply by guessing. Therefore, if respondents were to guess at the answers, their knowledge score may be slightly inflated. To decrease the amount of guessing by respondents, a "don't know" category was added to each question as a response category. During survey administration, students were encouraged (either by the research analyst or by the written survey instructions) to circle "don't know" for questions they were unsure of rather than guess at the answer.

2.2.1 Students' Overall Knowledge Scores

To provide a reliable measure of each theme, an index was created that measured the number of correct answers to all of the questions for a particular theme. For each respondent, calculating the percentage of correct answers for that theme created a theme knowledge score.

The overall knowledge scores in Figure 2-3 indicate that Wisconsin students are only somewhat knowledgable about energy. They are most knowledgeable about Theme IV — (Managing Energy Resource Use) and least knowledgeable about Theme II (Developing Energy Resources).

Figure 2-3:
Overall Knowledge Score by Theme



- In Theme I (We Need Energy), lower and higher grades had about the same scores on all the questions in the module (49% and 51%, respectively).
- Theme II (Developing Energy Resources) had the lowest knowledge scores for students. 4^{th} – 6^{th} graders only answered 38 percent of the questions correctly; 7^{th} – 12^{th} grade students answered 49 percent correctly.

- Knowledge of Theme III (“Effects of Energy Resource Development”) was almost identical to Theme I: 4th – 6th graders answered less than half of the questions correctly (47%); 7th – 12th graders answered about half correctly.

- Theme IV (“Managing Energy Resource Use”) is the best known among Wisconsin’s students. Sixty percent of the students answered the questions in this module correctly (60% of lower grades and 63% of higher grades).

2.2.2 Students’ Knowledge of Specific Items

Younger and older students tended to be knowledgeable on different specific issues (Table 2-6).

Table 2-6:
Specific Energy Knowledge Questions

		Percent Answering Correctly	
		4th – 6th grade students (n = 317)	**7th – 12th grades students (n = 514)**
Theme I: We Need Energy			
(Q1)	Earth's primary source of energy*	63%	56%
(Q3)	Properties of energy	80%	53%
(Q4)	Producers and consumers/energy properties	37%	23%
(Q5)	Food energy flows in living systems*	73%	74%
(Q6)	Dynamics of food chains	32%	51%
(Q7)	Definition of conduction/radiation	12%	47%
(Q20)	Difference between mechanical, kinetic, potential energy*	43%	50%
Theme II: Developing Energy Resources			
(Q2)	Identification of a nonrenewable energy resource*	38%	70%
(Q11)	Definition of fossil fuels/properties of energy	37%	32%
(Q12)	More nonrenewable energy sources	38%	50%
(Q14)	Primary energy sources for heating homes	42%	50%
(Q15)	Sources of energy for human use*	44%	73%
(Q17)	Energy sources for electricity/air pollutants	49%	NA
(Q21)	Potential energy/process of photosynthesis	28%	37%
(Q22)	Definition of electric current*	29%	51%
(Q24)	Wisconsin's primary renewable resource*	36%	32%
Theme III: Effects of Energy Resource Development			
(Q8)	Greenhouse effect/acid rain contributors	50%	50%
(Q9)	Coal burning and air pollution*	46%	65%
(Q10)	The effect of acid rain*	46%	63%
(Q13)	Nuclear power plants and air pollution*	48%	66%
(Q17)	The most prevalent air pollutants in WI	NA	6%
Theme IV: Managing Energy Resource Use			
(Q16)	The long-term availability of solar energy*	79%	88%
(Q18)	The future of oil supplies*	60%	79%
(Q19)	Conservation as a solution to shortage	50%	38%
(Q23)	Current state of solid waste disposal	52%	48%

* Question wording the same across all students.

Theme I — We Need Energy. Younger students outscored older students on many of the questions in this module.

- While 80 percent of the 4th – 6th graders chose the correct answer for the definition of energy only 53 percent of the 7th – 12th graders did the same. A higher percentage of 4th – 6th graders also reported they had studied this in school (see previous section).
- Younger students were also more likely to know that the sun is the earth's primary source of energy (63% versus 56%).
- Older students were not very knowledgeable about the properties of energy—only 23 percent knew that it is impossible to build a machine that produces more energy than it uses.
- Younger students were less knowledgeable about complex concepts, such as the definition of conduction (radiation for older students), the dynamics of food chains, and the definition of omnivores/herbivores/carnivores.
- Students from all grades were familiar with how energy flows in living systems.

Theme II — Developing Energy Resources. The higher grades scored much higher on individual questions in this module than did the lower grades.

- A high percentage of the 7th – 12th graders knew that the sun is a source of energy for humans (73%). The lower grades were less familiar with this concept (only 44% answered this question correctly).
- Wisconsin's 4th – 6th graders are not very knowledgeable about renewable resources (only about a third answered three related questions correctly). The 7th – 12th graders did somewhat better (scores ranged from 30% to about 70%).
- 4th – 6th graders are also somewhat unfamiliar with the definition of fossil fuels (37% answered correctly) and the definition of electric current (29% answered correctly).
- Wisconsin's 7th – 12th graders scored the lowest on a multiple-choice question asking about the properties of energy currently present on earth (32% answered correctly).

Theme III — Effects of Energy Resource Development. Older students scored only slightly better than younger students on the individual questions in this module.

- The relationship between coal burning and air pollution was a concept older students knew about (65%), but less than half of the lower grade students were aware of this (46%).

- Compared to younger students, older students were also more likely to know about the effect of acid rain (63% versus 46%) and the relationship between nuclear power plants and air pollution (66% versus 48%).

Theme IV — Managing Energy Resource Use. Both younger and older students scored high in this module.

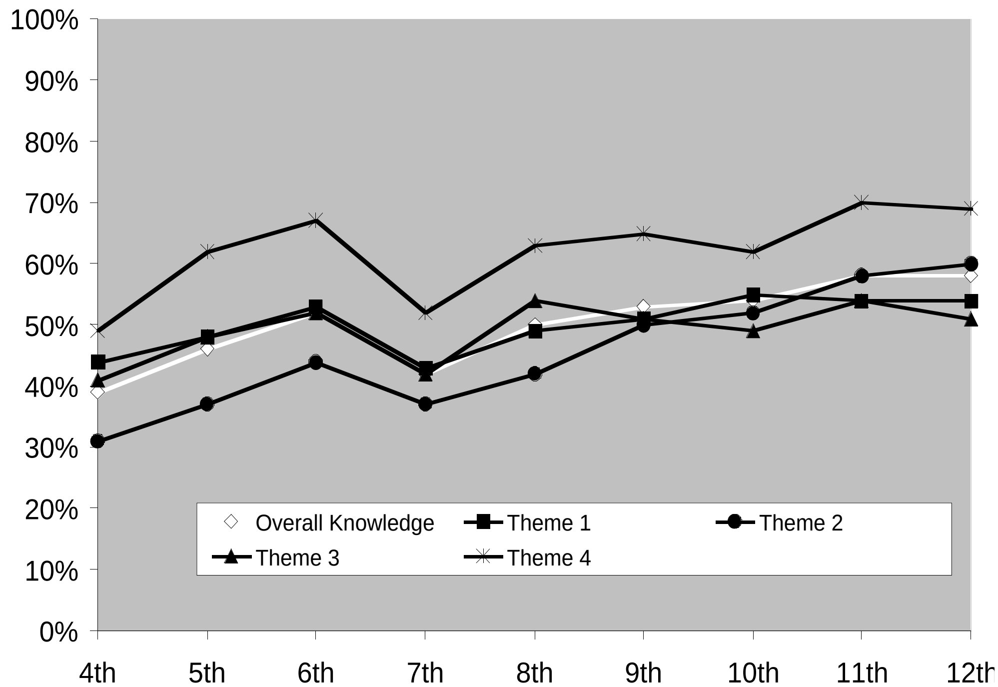
- Most students knew about the long-term availability of solar energy (79% and 88% of younger and older students, respectively) and the likely shortage of oil in the 21st century (60% and 79%).

- They were less likely to know that conservation is a solution to shortage (50% and 38%) or about the current state of solid waste disposal (52% and 48%).

2.2.3 Energy Knowledge Index by Grade

In general, Wisconsin students' energy knowledge increases by grade (Figure 2-4). However, this analysis showed a slight decrease in the index at the seventh grade level. One reason for this could be related to the design of the baseline survey. It is possible that the survey designed for the 7th – 12th grades was difficult for the seventh graders in this group. Also, decreases in test scores at the seventh and eighth grade levels are a phenomenon that has been observed in other educational research projects.

Figure 2-4:
Energy Knowledge Index by Grade Level



Energy knowledge scores for Theme II and Theme IV show the sharpest overall increase, while Themes I and III show a slight increase from 4th to 12th grades. Overall energy knowledge increases approximately 20 percentage points from 4th graders to 12th graders.

2.2.4 Students' Reported Learning and Their Energy Knowledge Score by Theme

Additional analyses were performed to see if students who reported studying a theme had higher energy knowledge scores than those who had not studied the theme. For each of the four themes, Table 2-7 compares the knowledge score of students who said they had studied at least one concept in the theme with scores of students who had not studied any of the concepts in the theme.

In all four themes, energy knowledge scores are higher for students who had studied the theme in school. This is particularly true for Themes III and IV, where the average knowledge score among students who had studied the theme is 11 percentage points higher than among those who had not.

Table 2-7:
Students' Reported Learning and their Energy Knowledge Score by Theme

Knowledge Score Theme I	Reported Studying Theme I	
	Yes	No
Below 50%	50%	55%
50 – 69%	26%	26%
70% or More	24%	19%
Total	100%	100%
Mean	50.29%	44.19%
Knowledge Score Theme II	**Reported Studying Theme II**	
	Yes	**No**
Below 50%	53%	60%
50 – 69%	31%	28%
70% or More	16%	12%
Total	100%	100%
Mean	45.93%	42.47%
Knowledge Score Theme III	**Reported Studying Theme III**	
	Yes	**No**
Below 50%	41%	66%
50 – 69%	33%	21%
70% or More	26%	13%
Total	100%	100%
Mean	49.41%	38.28%
Knowledge Score Theme IV	**Reported Studying Theme III**	
	Yes	**No**
Below 50%	19%	23%
50 – 69%	26%	33%
70% or More	55%	44%
Total	100%	100%
Mean	63.36%	58.41%

Without a benchmark or standardized scores with which to make comparisons, it is difficult to put the current state of Wisconsin students' energy knowledge into perspective. A number of relatively difficult questions were selected for each of the four themes, all of which would have required careful study of the KEEP materials to determine the correct answer. In addition, because this was a baseline study, the measures were chosen to cover a broad range of energy knowledge. As a result, it is not unexpected that the average percentage of correct scores on the energy knowledge quiz were in the 40 to 60 percent range for students.

2.3 DISCUSSIONS OF ENERGY IN THE HOME

The large majority of younger students remembered conversations in the home about saving energy and the cost of energy. Seventy-nine percent of 4^{th} – 6^{th} grade students whose parents filled out a survey said their family had talked about saving energy around the home. Of these, 61 percent remembered these conversations occurring at least once a month. Eighty percent also said their family talked about energy expenses. Of these, 59 percent said this type of energy-related conversation occurred at least once a month.

Almost the same percentages of older students whose parents filled out a survey also remembered energy saving/cost conversations. Seventy-nine percent said their family had discussed saving energy around the house; 57 percent of these thought that conversation had occurred at least once a month. Eighty-seven percent of the older students said they had also talked with their family about energy expenses. Of these, 59 percent reported this conversation took place at least once a month. Chapter 6 discusses the possible correlation between parents' energy knowledge and their child's energy knowledge and attitudes.

2.4 INTEREST IN ENERGY-RELATED ACTIVITIES

One key objective of the baseline survey was to find out what energy topics Wisconsin students were interested in studying. The same twelve energy questions that were used to determine whether students had studied the four KEEP energy themes (see Section 2.11) were also used to assess interest in the themes.

Overall, the majority of students are interested in learning about energy. Seventy-four percent said they would find these types of energy activities "okay" or "exciting."

2.4.1 Interest in Studying Energy Themes

As Table 2-8 shows, the largest percentage of students (70%) were interested in studying Theme III, the Effects of Energy Resource Development. A majority (60%) were also interested in studying Theme I, We Need Energy. Almost the same percentage (59%) were interested in studying Theme II, Developing Energy Resources. Theme IV, Managing Energy Resource Use, received the lowest ratings by students, although the majority still responded favorably. Fifty-six percent of the students were interested in learning Theme IV.

Table 2-8:
Interest in Studying Energy Themes

	Interested in One or More Concept[1]		
Energy Theme	**All Students (n = 821)**	**4th – 6th Grade Students (n = 307)**	**7th – 12th Grade Students (n = 514)**
Theme I: We Need Energy	60%	70%	54%
Theme II: Developing Energy Resources	59%	65%	56%
Theme III: Effects of Energy Resource Development	70%	71%	70%
Theme IV: Managing Energy Resource Use	56%	56%	55%

[1] Students who rated one or more concept in the theme as a 4 or 5 on a 5-point interest scale.

In Theme III, students of all ages are the most interested in learning how energy use affects the environment (Table 2-9). Several of the other topics received relatively low ratings by students. Topics having to do with the cost of energy, energy use throughout history, and the pros and cons of public versus private transportation were of much less interest than topics having to do with broader energy and environmental issues.

Table 2-9:
Interest in Specific Energy Topics – Theme III

	Percent Interested in Topic[1]	
	4th – 6th Grade Students (n = 307)	**7th – 12th Grade Students (n = 514)**
Theme III: The Effects of Energy Resource Development		
4th – 6th Grade Version		
How much it costs each year to run refrigerators and other appliances	39%	
The pros and cons of using public transportation versus private travel	29%	
How to safely use electricity around the home	40%	
How energy use affects the environment	51%	
7th – 12th Grade Version		
How energy prices are determined		35%
What can be done to address air pollution		44%
The kinds of energy used at earlier times in history		36%
How energy use affects the environment		44%

[1] Students who rated the topic as a 4 or 5 on a 5-point interest scale.

In Theme I, the topics of how energy is transferred between organisms in a food chain and the contribution of sun, wind, and water to the energy cycle are the most interesting to the younger students (Table 2-10). Why energy can neither be created nor destroyed is the favorite topic in this theme among 7^{th} – 12^{th} graders.

Table 2-10:
Interest in Specific Energy Topics – Theme I

	Percent Interested in Topic[2]	
	4^{th} – 6^{th} Grade Students (n = 307)	**7^{th} – 12^{th} Grade Students (n = 514)**
Theme I: We Need Energy		
4^{th} – 6^{th} Grade Version		
What energy is and where it comes from	36%	
Identifying forms of potential and kinetic energy	32%	
How energy is transferred between organisms in a food chain	40%	
The contribution of sun, wind, and water to the energy cycle	45%	
7^{th} – 12^{th} Grade Version		
How much energy is stored in foods		19%
How the sun's energy travels through organisms		24%
Why energy can neither be created nor destroyed		36%
How some energy becomes unavailable with each energy conversion		27%

[1] Students who rated the topic as a 4 or 5 on a 5-point interest scale.

Students found the topics of how electric circuits work and the advantages and disadvantages of nuclear energy interesting to study in Theme II (55% of 4th – 6th graders, 53% of 7th – 12th graders). How motors and generators work to make electricity and what products and materials are made from fossil fuels were of less interest (Table 2-11).

Table 2-11:
Interest in Specific Energy Topics – Theme II

	Percent Interested in Topic[1]	
	4th – 6th Grade Students (n = 307)	**7th – 12th Grade Students (n = 514)**
Theme II: Developing Energy Resources		
4th – 6th Grade Version		
What products and materials are made from fossil fuels	46%	
How electric circuits work	55%	
7th – 12th Grade Version		
The advantages and disadvantages of nuclear energy		53%
How motors and generators are used to meet energy needs		36%

[1] Students who rated the topic as a 4 or 5 on a 5-point interest scale.

In Theme IV, slightly less than half of the students reported they would be interested in studying how to save energy in their home (46% of younger students) or how solar and wind energy could be used in their home (48% of older students) (Table 2-12).

Table 2-12:
Interest in Specific Energy Topics – Theme IV

	Percent Interested in Topic[1]	
	4th – 6th Grade Students (n = 307)	**7th – 12th Grade Students (n = 514)**
Theme IV: Managing Energy Resource Use		
4th – 6th Grade Version		
How to save energy in your home	46%	
How business and industry can save energy	40%	
7th – 12th Grade Version		
How solar and wind energy could be used in your home		48%
Career opportunities associated with energy development and use		31%

[1] Students who rated the topic as a 4 or 5 on a 5-point interest scale.

In general, students report higher levels of interest in broader topics (such as the role of energy in the environment or the role of sun, wind, and water in the energy cycle) that help them to place energy in the context of issues. Some of the more specific energy topics, such as how electric motors work or how business and industry can save energy, require more specialized interest and aptitude, so a smaller proportion of students and parents will express an interest in these topics. Energy education topics and concepts that are incorporated into other subject areas, such as social studies, business, or family and consumer science, should focus on the broader context of energy issues and how energy is related to key issues in each of these subjects. Discussions of energy in this broader context may help to increase the "relevance" of energy topics and may spark increased student interest in additional energy topics during their school careers.

2.5 COMMITMENT TO ENERGY CONSERVATION AND EDUCATION

Students were asked several questions to find out (1) what they would (or would not be) willing to do to save energy (*verbal* commitment to conservation actions and education), (2) what energy conservation and education actions they had already taken (*actual* commitment to conservation), and (3) their attitudes toward conservation actions and education. The questions were designed to measure 11 concepts related to energy conservation and education: (1) saving water, (2) saving energy, (3) reducing air pollution, (4) reusing materials, (5) reducing consumption of materials, (6) recycling, (7) learning about energy, (8) influencing others to take energy conservation action, (9) personal responsibility toward energy conservation, (10) personal responsibility toward the environment, and (11) personal responsibility toward home energy use. Tables 2-13 and 2-14 show the actual questions asked of students to measure each of the concepts.

Table 2-13:
Attitudinal Questions Used to Measure Energy Conservation and Education Concepts

4th – 6th Grade Students			
Concept	**Verbal Commitment**	**Actual Commitment**	**Attitude**
Saving water/water pollution	To save water, I am willing to turn off the water when I brush my teeth	I try to save water	I am not concerned if a little water gets polluted because there is plenty of water
Reusing	I would rather throw something away instead of trying to fix it[1]	I usually throw my old clothes and toys in the garbage instead of trying to give them to someone else who could use them[1]	I get upset when I think of things people throw away that could be reused
Saving energy	To save energy, I am willing to watch one hour less of TV per day	To save energy, I turn off the lights without being asked	It makes me happy to see people saving energy
Reducing air pollution	To reduce air pollution, I am willing to ride the bus, ride my bike, or walk to more places instead of getting a ride in the car	I walk to places that are nearby instead of asking for a ride	I am not concerned about the effects of pollution on my family[1]
Recycling	I am willing to throw plastic and glass in a separate recycling trash can.	I separate cans and bottles for recycling	It makes me happy when people recycle used bottles, cans, and paper
Reducing waste	I would rather use paper plates than wash dishes by hand[1]	I use paper plates whenever I can so I don't have to wash dishes[1]	It bothers me to know that I throw so many things in the garbage
Learning about energy	I do not want to spend more time learning about energy[1]	I never ask my parents how to save energy in our home[1]	It makes me happy to learn new ways to save energy

Table 2-13:
Attitudinal Questions Used to Measure Energy Conservation and Education Concepts

4th – 6th Grade Students			
Concept	**Verbal Commitment**	**Actual Commitment**	**Attitude**
Influencing others to take energy actions	I would feel uncomfortable asking someone not to litter[1]	I remind my family to turn off lights to save energy.	NA
Personal responsibility toward energy conservation	NA	NA	Energy problems will only be solved when people like me change the way we live
Personal responsibility toward environment	NA	NA	When I have done something that harms the environment I feel there is very little I can do to make it right[1]
Personal responsibility toward home energy use	NA	NA	Things I do don't have much effect on the energy use in my home[1]

[1] These items were reverse-coded during analysis.

Table 2-14:
Attitudinal Questions Used to Measure Energy Conservation and Education Concepts

7th – 12th Grade Students			
Concept	**Verbal Commitment**	**Actual Commitment**	**Attitude**
Saving water/water pollution	To save water, I am willing to turn off the water when I brush my teeth	I try to save water	I am concerned about environmental health hazards such as those caused by air or water pollution
Reusing	I am willing to purchase one product instead of another because it is packaged in reusable, returnable or recyclable containers or packages	I usually throw my old clothes and toys in the garbage instead of trying to give them to someone else who could use them[1]	I get upset when I think of things people throw away that could be reused
Saving energy	To save energy, I am willing to watch one hour less of TV per day	To save energy, I turn off lights and appliances when they are not being used.	It makes me happy to see people saving energy
Reducing air pollution	To reduce air pollution, I am willing to ride the bus, ride my bike, or walk to more places instead of using a car	I have walked more places in order to do my part in helping to solve pollution problems	I am not concerned about the effects of pollution on my family[1]
Recycling	I am willing to throw plastic and glass in a separate recycling trash can.	I separate things at home for recycling	I think recycling is worth the effort.
Reducing waste	I would rather use paper plates than wash dishes by hand[1]	I buy things that I want regardless of how they are packaged[1]	I am concerned about how much waste is produced in this country.
Learning about energy	I do not want to spend more time learning about energy[1]	I usually do not read newspaper or magazine articles about energy issues[1]	Knowing about environmental problems and issues is important to me.
Influencing others to take energy actions	I would feel uncomfortable asking someone not to litter[1]	I try to talk my friends into recycling pop cans instead of throwing them in the trash	NA

Table 2-14: Attitudinal Questions Used to Measure Energy Conservation and Education Concepts			
7th – 12th Grade Students			
Concept	**Verbal Commitment**	**Actual Commitment**	**Attitude**
Personal responsibility toward energy conservation	NA	NA	Energy problems will only be solved when people like me change the way we live.
Personal responsibility toward environment	NA	NA	When I have done something that harms the environment I feel there is very little I can do to make it right[1]
Personal responsibility toward home energy use	NA	NA	Things I do don't have much effect on the energy use in my home[1]

[1] These items were reverse coded during analysis.

2.5.1 Verbal Commitment to Energy Conservation

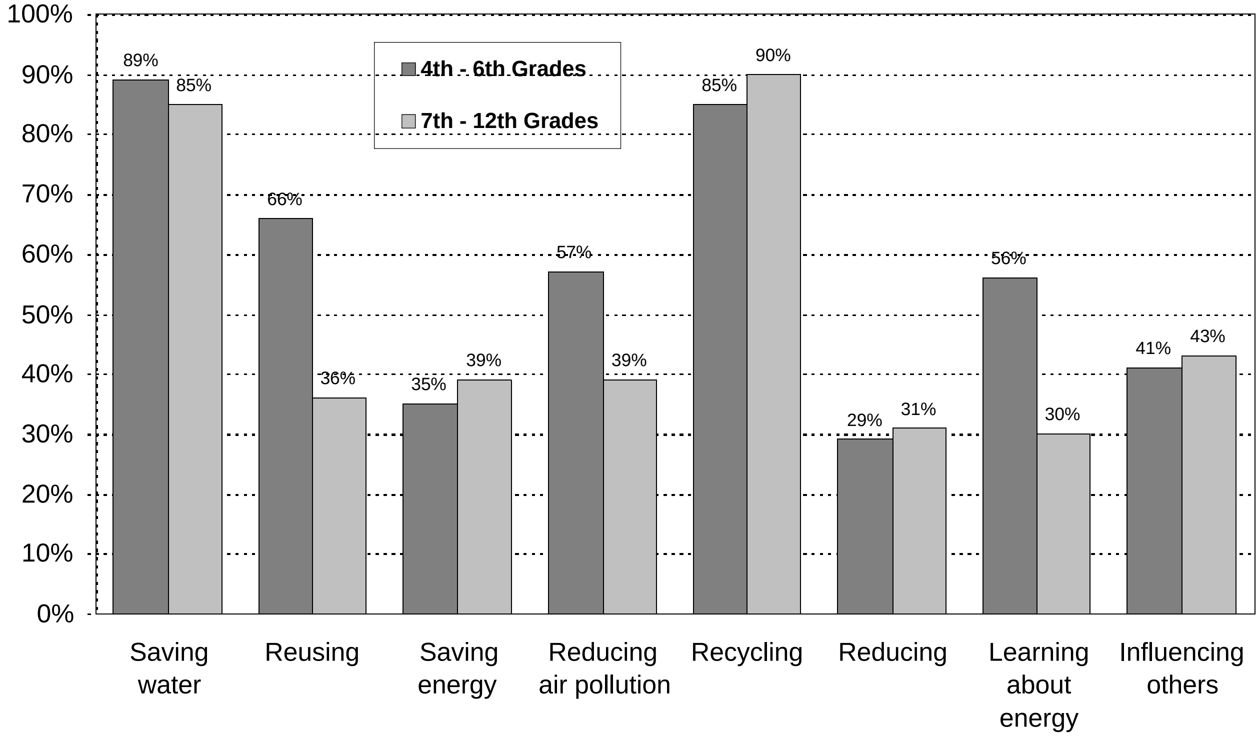
The baseline survey asked students to indicate their willingness to take eight specific actions that were directly or indirectly related to energy conservation ("verbal commitment" in Tables 2-13 and 2-14). They rated these willingness-to-take-action questions by indicating whether the statement was very true, mostly true, not sure, mostly false, or very false for them individually.

The vast majority of students say they would be willing to take waste recycling and water conservation actions (Figure 2-5). Almost all students (85% of 4th – 6th graders and 90% of 7th – 12th graders) say they would be willing to recycle. (However, for this question, it is important to note that these responses may reflect the fact that many Wisconsin cities have community-wide programs in place that already require this type of action.) Almost as many students would be willing to turn off the water when brushing their teeth in order to save water (89% of 4th – 6th graders and 85% of 7th – 12th graders).

- Only 56 percent of 4th – 6th grade students and only 30 percent of 7th – 12th grade students are interested in learning about energy.
- About 40 percent of students would feel comfortable (41% of 4th – 6th graders and 43% of 7th – 12th graders) influencing others to take environmental actions (e.g., asking them not to litter).

- 66 percent of 4th – 6th grade students and only 36 percent of 7th – 12th grade students would be willing to purchase one product over another because of its reusable, returnable, or recyclable packaging ("Reusing" in Figure 2-5).
- Only 29 percent of 4th – 6th grade students and 31 percent of 7th – 12th grade students would rather wash dishes than use paper plates (thus reducing waste).

Figure 2-5:
Willingness to Take Energy Conservation Action*



* Percent saying very true or mostly true.

To reduce air pollution, younger students are fairly willing to walk, ride their bike, or take the bus rather than use the car (66% of 4^{th} – 6^{th} grade students compared to 39 percent of 7^{th} – 12^{th} grade students). Younger students are more willing than older students to take several conservation actions:

- Younger students are more willing (66%) to reuse than older students (36%).
- In addition, younger students are willing to spend more time learning about energy (56%) than are older students (30%).

2.5.2 Actual Commitment to Energy Conservation

After assessing their willingness to consider the above energy conservation actions, students were asked eight questions that assessed actual energy conservation commitments they were currently making ("actual commitment" in Tables 2-13 and 2-14).

Since students are less likely than their parents to feel they have control over their actions affecting energy consumption, it is not surprising that compared to their parents they have made fewer commitments to energy conservation (Figure 2-6).

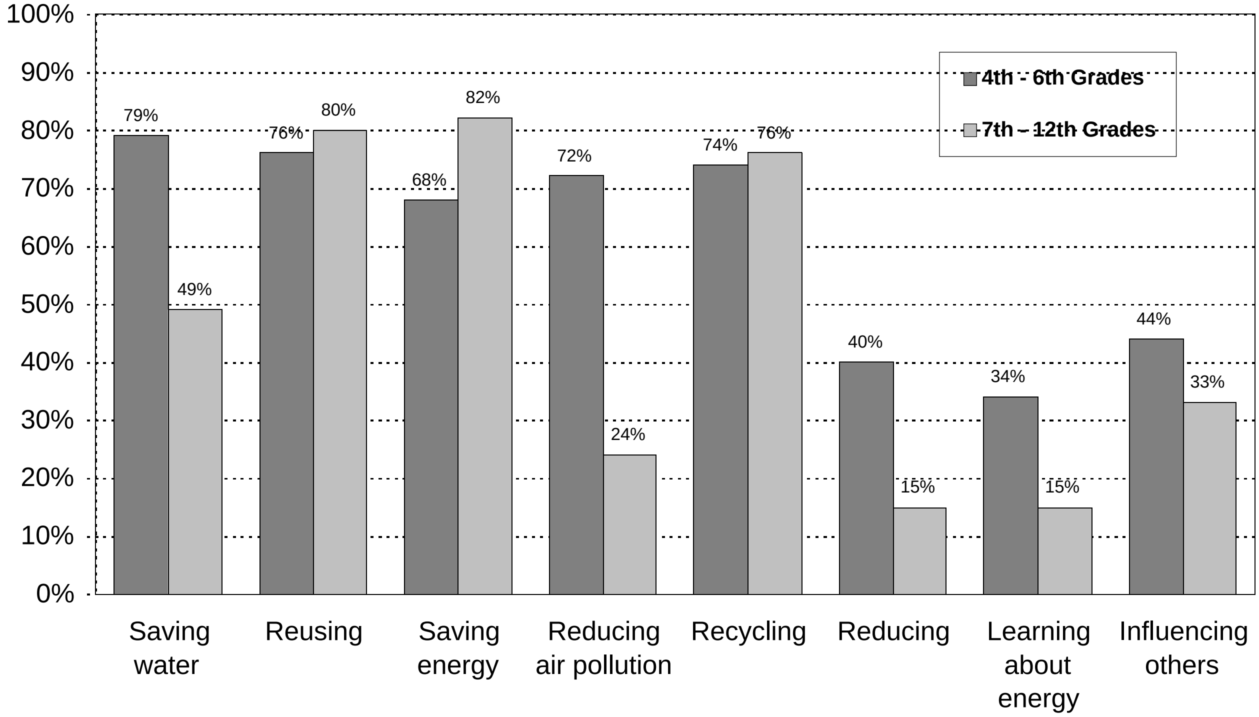
- Only 44% of 4^{th} – 6^{th} graders and 33% of 7^{th} – 12^{th} graders are likely to influence others by talking their friends into recycling pop cans.
- But 82 percent of 7^{th} – 12^{th} grade students and 68 percent of 4^{th} – 6^{th} grade students report saving energy by turning off lights and appliances when not being used.
- 76 percent of 7^{th} – 12^{th} grade students and 74 percent of 4^{th} – 6^{th} grade students say they recycle by separating things at home.
- But only 34 percent of 4^{th} – 6^{th} grade students and 15 percent of 7^{th} – 12^{th} grade students say they learn about energy by reading newspaper and magazine articles.

Similar to the set of willingness questions above, younger students are more likely than older students (72% versus 24%) to walk places to do their part in helping solve air pollution problems. The students' actual commitment to saving energy differed by grade level:

- Most of the 7^{th} – 12^{th} graders (82%) turn off lights and appliances when not being used compared to 68 percent of the 4^{th} – 6^{th} graders ("Saving Energy").
- But in related reducing-waste questions ("Reducing"), 40 percent of younger students say they wash dishes rather than use paper plates, but only 15% of older students are aware of the packaging of the products they buy.

- Younger students are also more likely than older students (34% versus 15%) to read a newspaper or magazine article about energy conservation ("Learning about Energy").

Figure 2-6:
Actual Energy Conservation Commitments*



* Percent saying very true or mostly true.

2.5.3 Attitudes Towards Energy Conservation Actions and Education

Ten statements were presented to students to assess their attitudes toward energy conservation actions and education ("attitude" in Tables 2-12 and 2-13) (Figure 2-7).

- Nearly all of the students (89% of 7^{th} – 12^{th} graders and 75% of 4^{th} – 6^{th} graders) think recycling is worth the effort.

- 69 percent of 7^{th} – 12^{th} grade students and 63 percent of 4^{th} – 6^{th} grade students are concerned about the effects of pollution on their family.

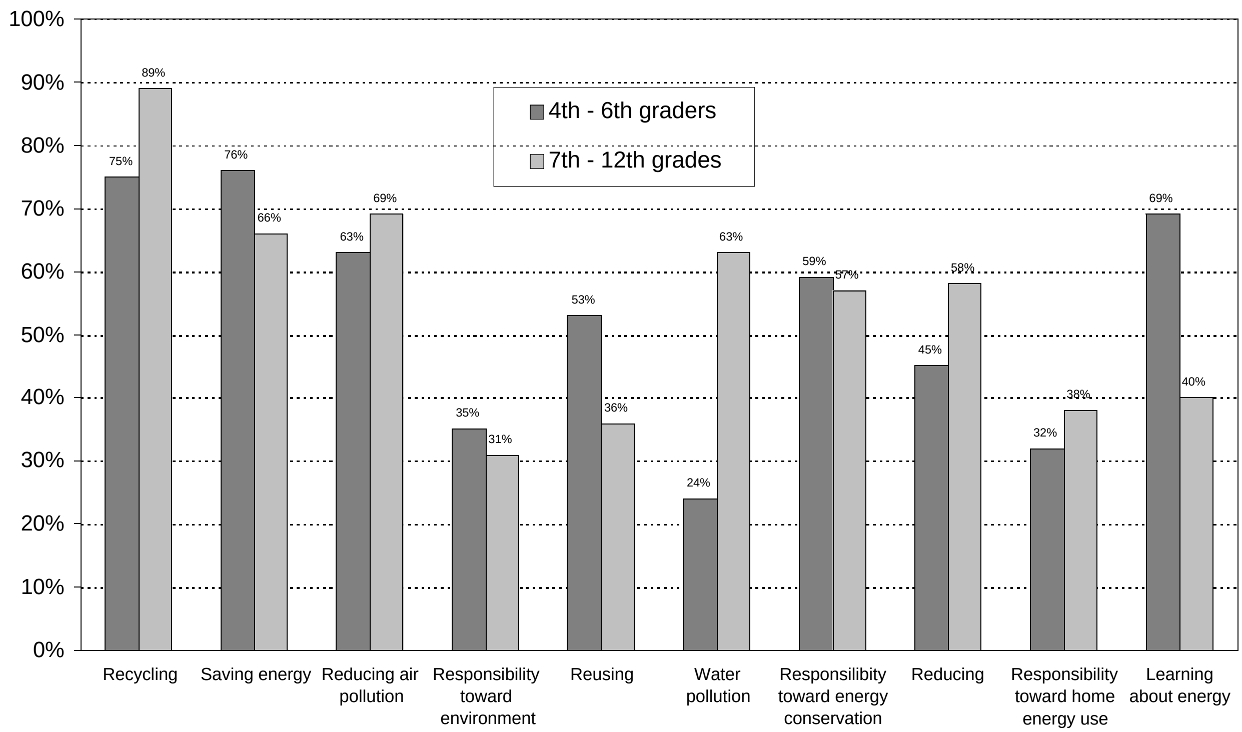
- 63 percent of 7^{th} – 12^{th} grade students and 24 percent of 4^{th} – 6^{th} grade students are also concerned about water pollution.

- 58 percent of 7^{th} – 12^{th} grade students and 45 percent of 4^{th} – 6^{th} grade students are equally concerned about reducing waste.

- Only 38 percent of 7th – 12th grade students and 32 percent of 4th – 6th grade students feel the things they do affect energy usage in their home.

- Over half of the students (51%) think it is important to know about environmental problems and issues.

Figure 2-7:
Attitudes Toward Energy Conservation*



* Percent saying very true or mostly true.

Students in the two age groups reported similar attitudes toward saving energy and energy conservation, reducing air pollution, and responsibility toward the environment. Students felt recycling, saving energy, and reducing air pollution were important energy conservation actions. However, there are some important attitudinal differences as well:

- 7th – 12th graders (89%) have a slightly more positive attitude toward recycling than do 4th – 7th graders (75%).

- Water pollution is of more concern to the higher grades (63%) than to the lower grades (24%).

- But 4^{th} – 6^{th} graders (53%) are more likely to say they get upset when they think of things people throw away that could be reused (“Reusing” in Figure 2-7) than do 7^{th} – 12^{th} graders (36%).

- In related questions on learning about energy, more than two-thirds of 4^{th} – 6^{th} graders (69%) said that it makes them happy to learn new ways to save energy. This compares to only 40 percent of the older students who said in a companion question that it was important to know about environmental problems and issues.

The baseline survey measures indicate that a large majority of students say they are willing to take actions to recycle, save energy, save water, and reduce air pollution. Students’ reported behaviors, however, indicate that a substantially smaller number are currently engaging in these activities. One reason for this is that students feel relatively low levels of responsibility for environmental actions or even for saving energy in their own homes. Only about one-third of the students feel that the things they do affect energy use in their home. Research on the relationship between attitudes and behaviors has shown that assuming a feeling of personal responsibility for energy use and its consequences is an important factor in motivating people to take actions to conserve energy and use resources wisely.

A lack of the knowledge and skills required to perform specific behaviors may also be an important reason why pro-environmental attitudes do not always lead to comparable actions to reduce energy use or environmental impacts. In order to increase the likelihood of energy conservation behaviors among students, energy education programs need to emphasize the personal responsibility of students and all individuals to do their part to benefit society. Energy education programs also need to provide instruction to teach students how to take specific actions appropriate to their age group to enable them to act on their commitment to saving energy, recycling, or reducing water use. If students feel personally responsible and have the specific skills required to take conservation actions, they will be more likely to engage in these behaviors.

CHAPTER 3
ENERGY KNOWLEDGE AND ATTITUDES AMONG WISCONSIN PARENTS

Every child who completed a survey in the classroom was given a take-home survey for one of their parents to complete. The parent survey was very similar to the 7^{th} – 12^{th} grade version of the student survey. Statistical tests presented in this chapter should be evaluated conservatively, meaning the confidence interval around the estimates is wider than would be obtained using less conservative levels of statistical significance. For a sample size of 440 the 99 percent confidence interval is ± 6.1%. Additional data tables containing the results of the parent baseline surveys by school district size strata, energy knowledge score, overall willingness to conserve energy, actual commitment to conserving energy, and overall energy attitudes are available separately from the Energy Center.

3.1 INTERPRETATION OF PARENTS' RESULTS

Completed surveys were received from only about half of the parents (53%). Response rates for parents varied by student grade level. The overall response rate for parents of 4^{th} – 6^{th} grade students was 71 percent, while only 43 percent of parents of 7^{th} – 12^{th} grade students returned a survey. One possible reason for the different response rates, based on anecdotal information from the research analysts who administered the surveys, is that teachers of younger grades were more likely to offer the students an incentive for returning the parent survey. In many middle and elementary schools appropriate types of incentive programs were already in place, so it was very simple and effective for teachers to reward students who returned the survey with a treat, bonus points, or some other type of incentive.

Given the fact that 47 percent of parents (who should have received a survey from their student) did not complete and return a survey, there is a potential for nonresponse bias based on differences between parents who did and did not respond.

First, in order to determine if the parents who responded to the survey are atypical for Wisconsin, data on Wisconsin residents' energy attitudes from the Center's 1995 Central Wisconsin Study were compared to the parents' baseline survey results. Both groups (parents in the baseline survey and residential adult respondents for the Central Wisconsin Study) report positive attitudes toward energy conservation and a high level of willingness to take energy conservation actions. Although this comparison does not indicate any bias among the parent sample, it does not provide conclusive evidence of the lack of nonresponse bias. The Central Wisconsin Study represents residential adult customers from a specific area in Wisconsin. Furthermore, respondents are not necessarily parents, and the questions are not worded exactly the same. Therefore, direct statistical comparisons cannot be conducted to test for differences.

Another hypothesis regarding the potential for nonresponse bias for the parent sample is that students with positive energy conservation attitudes and behavior may have been more likely to take the parent survey home and ask a parent to complete it than students with less positive attitudes. The implication is that households where students and parents have more positive energy attitudes may have been more likely to complete the survey.

Table 3-1:
The Energy Behaviors of Students Whose Parents Returned a Survey Compared to Students Whose Parents Did Not Return a Survey

Overall Willingness to Conserve Energy[1]	**Parents Completed Survey**	
	Yes	**No**
Willing to take energy actions[2]	44%	35%
Neutral[3]	48%	50%
Not willing to take energy actions[4]	8%	15%
Total	100%	100%
Actual Commitment to Conserve Energy[1]		
Committed to energy conservation[2]	44%	28%
Neutral[3]	46%	55%
Not committed to energy conservation[4]	10%	17%
Total	100%	100%
Overall Energy Attitudes[1]		
Positive towards energy conservation and education[2]	51%	41%
Neutral[3]	44%	53%
Negative towards energy conservation and education[4]	5%	6%
Total	100%	100%

[1] Overall energy willingness, commitment and attitudes was calculated by summing the individual 1 to 5 ratings each respondent gave to a battery of questions in these three areas. An average score was then applied to each respondent indicating their overall rating.
[2] Respondents' whose overall rating was 1 – 2.4.
[3] Respondents' whose overall rating was 2.5 – 3.4.
[4] Respondents' whose overall rating was 3.5 – 5.

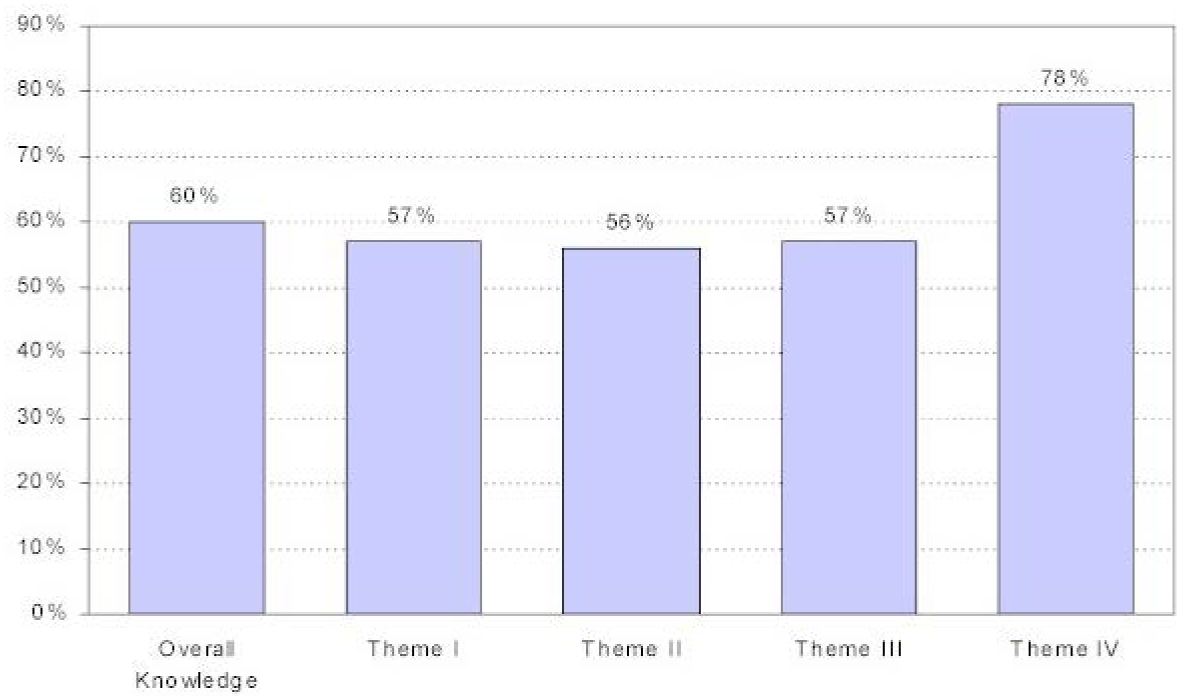
The data in Table 3-1 support this latter hypothesis. These data show that students whose parents completed a survey were also more willing to conserve energy, had a greater commitment to conserving energy, and had more positive overall energy attitudes than students whose parents did not complete the survey. If we assume that parents' attitudes tend to be consistent with those of their student children, it is likely that parents who did not complete and return the survey have less positive energy attitudes than those parents who responded. The data in Table 3-1 suggest that the results from the parent survey reported in this chapter may indicate somewhat more favorable attitudes and behavior towards energy conservation and education than are true for the entire population of Wisconsin parents.

3.2 PARENTS' CURRENT ENERGY KNOWLEDGE

The same 24 multiple-choice questions that were used to assess the current level of energy knowledge among 7th – 12th grade students were used to assess this knowledge among parents. Each of the 24 questions had been selected to correspond to one of the four KEEP energy themes.

For measuring energy knowledge, the multiple-choice format has some limitations. If respondents have four answer choices and do not know the answer, they have a 25 percent chance of selecting the correct one simply by guessing. Therefore, if respondents were to guess at the answers, their knowledge score may be slightly inflated. To decrease the amount of guessing by respondents, a "don't know" category was added to each question as a response category. During survey administration, parents were encouraged by the written survey instructions to circle "don't know" for questions they were unsure of rather than guess at the answer.

Figure 3-1:
Parents' Overall Knowledge Score by Theme



3.2.1 Parents' Overall Knowledge Scores

The overall knowledge scores in Figure 3-1 indicate that Wisconsin parents are only somewhat knowledgeable about energy. They are most knowledgeable about Theme IV—Managing Energy Resource Use—and least knowledgeable about Theme II—Developing Energy Resources.

- Theme IV ("Managing Energy Resource Use") is the best known among Wisconsin's parents. Parents scored the highest in this theme (78% answered correctly).

- Parents' knowledge scores were almost exactly the same for Themes I, II, and III.

3.2.2 Parents' Knowledge of Specific Items

Parents' knowledge of specific questions within a theme varied. (Table 3-2)

- In Theme I—We Need Energy—a high percentage of parents answered correctly when asked what happens to light bulb energy that is not spent in producing light and how energy flows through living systems (81% for both questions). In the same theme, however, only a third correctly answered a question on the laws governing energy (31%).

- In Theme II—Developing Energy Resources—almost all parents correctly named a source of energy for human use (90%). The majority also knew about renewable energy resources (82%). But most did not know that energy currently present can change forms but is not destroyed (only 23% answered correctly). In addition, most parents did not know that wood is the primary renewable source of energy in Wisconsin (only 33% answered correctly).

- In Theme III—Effects of Energy Resource Development—parents did quite well. For instance, they knew that nuclear power plants produce less air pollution (81% answered correctly), and two-thirds correctly answered three other questions. However, only 10% knew that ozone is the most prevalent air pollutant in Wisconsin.

- Parents also did quite well in Theme IV —Managing Energy Resource Use. Most knew about the long-term availability of solar energy (93%); the likely shortages of oil supplies in the 21st century (85%); how solid waste is currently disposed of (71%); and that conservation was a solution to resource shortages (62%).

Table 3-2:
Parents' Specific Energy Knowledge Questions

		Percent Answering Correctly
		Parents (n = 440)
Theme I: We Need Energy		
(Q1)	Earth's primary source of energy	58%
(Q3)	Properties of energy	81%
(Q4)	Producers and consumers/energy properties	31%
(Q5)	Food energy flows in living systems	81%
(Q6)	Dynamics of food chains	62%
(Q7)	Definition of conduction/radiation	43%
(Q20)	Difference between mechanical, kinetic, potential energy	46%
Theme II: Developing Energy Resources		
(Q2)	Identification of a nonrenewable energy resource	82%
(Q11)	Definition of fossil fuels/properties of energy	23%
(Q12)	More nonrenewable energy sources	55%
(Q14)	Primary energy sources for heating homes	64%
(Q15)	Sources of energy for human use	90%
(Q17)	Energy sources for electricity/air pollutants	NA
(Q21)	Potential energy/process of photosynthesis	43%
(Q22)	Definition of electric current	57%
(Q24)	Wisconsin's primary renewable resource	33%
Theme III: Effects of Energy Resource Development		
(Q8)	Greenhouse effect/acid rain contributors	63%
(Q9)	Coal burning and air pollution	68%
(Q10)	The effect of acid rain	65%
(Q13)	Nuclear power plants and air pollution	81%
(Q17)	The most prevalent air pollutants in WI	10%
Theme IV: Managing Energy Resource Use		
(Q16)	The long-term availability of solar energy	93%
(Q18)	The future of oil supplies	85%
(Q19)	Conservation as a solution to shortage	62%
(Q23)	Current state of solid waste disposal	71%

Without a benchmark or standardized scores with which to make comparisons, it is difficult to put the current state of the energy knowledge of Wisconsin's parents into perspective. A number of relatively difficult questions were selected for each of the four themes. To answer many of these correctly would have required a careful study of the KEEP materials. In addition, because this was a baseline study, the measures were selected to cover a broad range of energy knowledge. As a result, it is not unexpected that parents' average percentage of correct scores for specific items in the energy knowledge quiz were in the 40 to 60 percent range.

3.3 DISCUSSIONS OF ENERGY IN THE HOME

Nearly all (97%) of the parents surveyed in the baseline survey said they had talked with their children about saving energy around the home—e.g., shutting off lights when not in use, turning down the heat, and closing doors and windows. Of these, 76 percent said this topic came up at least once a month. Energy expenses—e.g., the size of the electricity or home heating bill or the cost of gasoline for the car—was also a familiar topic in Wisconsin homes (91% of parents said they had talked about this with their children). This topic also came up frequently (76% of the parents said they discussed this at least once a month with their children). Chapter 6 discusses the possible correlation between parents' energy knowledge and their child's energy knowledge and attitudes.

3.4 INTEREST IN ENERGY-RELATED ACTIVITIES

One key objective of the baseline survey was to find out what energy topics Wisconsin parents thought were important for their child to study. The same twelve energy questions that were used to determine whether students had studied the four KEEP energy themes (see Section 2.1.1) were used to assess parents' interest in the themes.

Overall, most parents are interested in having their child study energy topics at school. Almost all of the parents (99%) said they would find value in activities at school to teach their child about what energy is, how it is used, and ways in which energy use affects the environment.

3.4.1 Interest in Having Their Child Study Energy Themes

Table 3-3 shows that Wisconsin parents are the most interested in having their child study Theme III, the Effects of Energy Resource Development (93%). Themes I, II, and III all received about the same overall importance ratings.

Table 3-3:
Parents' Interest in Having Their Child Study Energy Themes

	Rate One or More Concept Important[1]
Energy Theme	**Parents (N = 440)**
Theme I: We Need Energy	85%
Theme II: Developing Energy Resources	88%
Theme III: Effects of Energy Resource Development	93%
Theme IV: Managing Energy Resource Use	85%

[1] Parents who rated one or more concept in the theme as a 4 or 5 on a 5-point importance scale.

About half of the parents rated each of the 12 specific items within these themes as important for their child to study (Table 3-4).

- In Theme I, 73 percent of the parents thought the topic of why energy can neither be created nor destroyed was important for their child to study. Seventy percent also thought their child should know how some energy becomes unavailable with each energy conversion. Fewer (about half) thought it was important for their child to study how much energy is used in foods or how the sun's energy travels through organisms.

- In Theme II, about three-quarters or more of the parents thought both items were important for their child to study.

- In Theme III, a high percentage of parents thought two topics were important for their child to study: the topic of what can be done to address air pollution and the topic of how energy use affects the environment (88% for both topics). The kinds of energy used in earlier times received the lowest rating in all 12 items (47%).

- In Theme IV, a large majority of parents thought their child should know how solar and wind energy could be used in the home. A high percentage were also interested in having their child learn about career opportunities associated with energy development and use (81%).

Table 3-4:
Parents' Interest in Specific Energy Topics

	Rate One or More Concept Important[1]
Energy Theme	**Parents (N = 440)**
Theme I	
How much energy is stored in foods	50%
How the sun's energy travels through organisms	55%
Why energy can neither be created or destroyed	73%
How some energy becomes unavailable with each energy conversion	70%
Theme II	
The advantages and disadvantages of nuclear energy	85%
How motors and generators are used to meet energy needs	72%
Theme III	
How energy prices are determined	66%
What can be done to address air pollution	88%
The kinds of energy used at earlier times in history	47%
How energy use affects the environment	88%
Theme IV	
How solar and wind energy could be used in your home	81%
Career opportunities associated with energy development and use	71%

[1] Parents who rated the topic a 4 or 5 on a 5-point scale.

In general, parents appear to be more interested in having their children study practical applications associated with energy. They rate as important topics like what can be done to address air pollution, how solar/wind energy could be used in the home, and the advantages or disadvantages of nuclear energy. They were less interested in the theory and history of energy use.

3.4.2 Commitment to Energy Conservation and Education

Parents were asked several questions to find out what they would (or would not be) willing to do to save energy (*verbal* commitment to conservation actions and education), what energy conservation and education actions they had already taken (*actual* commitment to conservation), and their attitudes toward conservation actions and education. The questions were designed to measure 11 concepts related to energy conservation and education: (1) saving water, (2) saving energy, (3) reducing air pollution, (4) reusing materials, (5) reducing consumption of materials, (6) recycling, (7) learning about energy, (8) influencing others to take energy conservation action, (9) personal responsibility toward energy conservation, (10) personal responsibility toward the environment, and (11) personal responsibility toward home energy use. Table 3-5 show the actual questions asked of parents to measure each of the concepts.

Table 3-5:
Attitudinal Questions Used to Measure Energy Conservation and Education Concepts

Concept	Verbal Commitment	Actual Commitment	Attitude
Saving water/water pollution	To save water, I am willing to turn off the water when I brush my teeth	I try to save water	I am concerned about environmental health hazards such as those caused by air or water pollution
Reusing	I am willing to purchase one product instead of another because it is packaged in reusable, returnable or recyclable containers or packages	I usually throw my old clothes in the garbage instead of trying to give them to someone else who could use them[1]	I get upset when I think of things people throw away that could be reused
Saving energy	To save energy, I am willing to watch one hour less of TV per day	To save electricity, I turn off lights and appliances when they are not being used.	It makes me happy to see people saving energy
Reducing air pollution	To reduce air pollution, I am willing to ride the bus, ride my bike, or walk to more places instead of using a car	I have walked more places in order to do my part in helping to solve pollution problems	I am not concerned about the effects of pollution on my family[1]

Concept	Verbal Commitment	Actual Commitment	Attitude
Recycling	I am willing to throw plastic and glass in a separate recycling trash can.	I separate things at home for recycling	I think recycling is worth the effort.
Reducing waste	I would rather use paper plates than wash dishes by hand[1]	I buy things that I want regardless of how they are packaged[1]	I am concerned about how much waste is produced in this country.
Learning about energy	I do not want my children to spend more time learning about energy[1]	I usually do not read newspaper or magazine articles about energy issues[1]	Knowing about environmental problems and issues is important to me.
Influencing others to take energy actions	I would feel uncomfortable asking someone not to litter[1]	I tell my children to recycle pop cans instead of throwing them in the trash	NA
Personal responsibility toward energy conservation	NA	NA	Energy problems will only be solved when people like me change the way we live.
Personal responsibility toward environment	NA	NA	When I have done something that harms the environment I feel there is very little I can do to make it right[1]
Personal responsibility toward home energy use	NA	NA	Things my children do don't have much effect on the energy use in my home[1]

Table 3-5: Attitudinal Questions Used to Measure Energy Conservation and Education Concepts

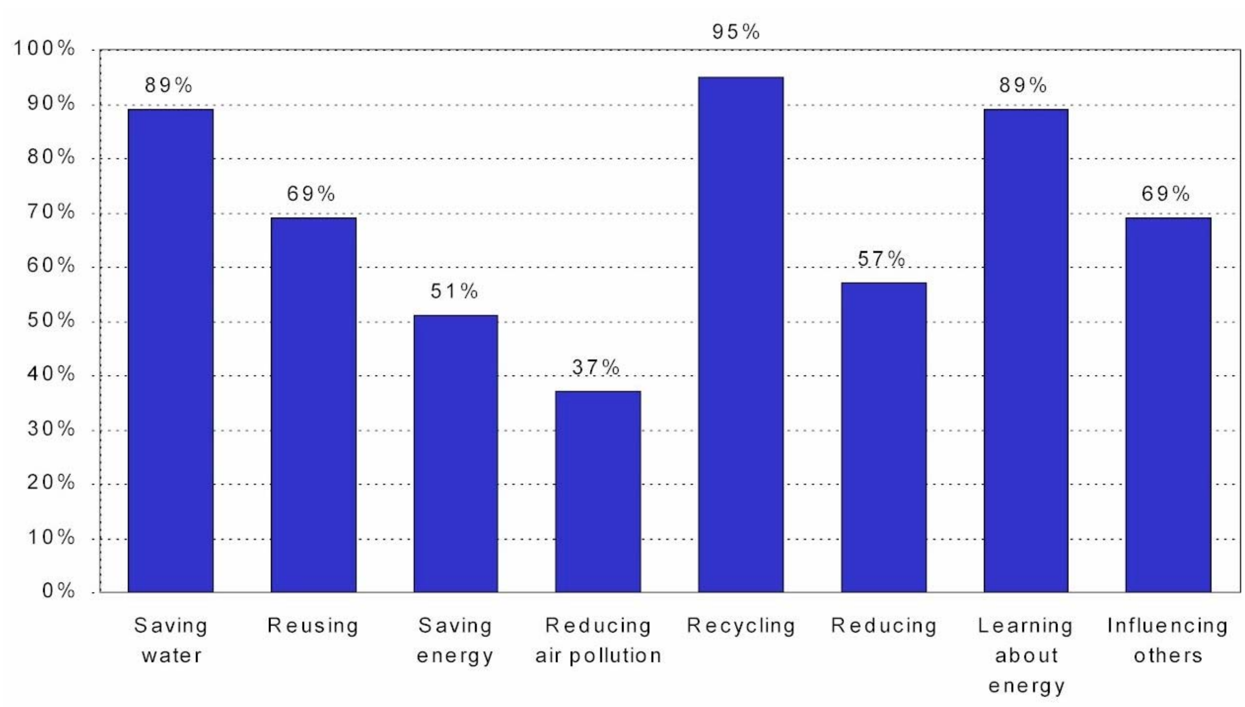
[1] These items were reverse coded during analysis.

3.4.3 Verbal Commitment to Energy Conservation

The baseline survey asked parents to indicate their willingness to take eight specific actions that were directly and indirectly related to energy conservation ("verbal commitment" in Table 3-5). They rated these willingness-to-take-action questions by indicating whether the statement was very true, mostly true, not sure, mostly false, or very false for them individually.

The vast majority of parents say they would be willing to take waste recycling and water conservation actions (Figure 3-5). Almost all of the parents (95%) say they would be willing to recycle. (However, for this question, it is important to note that these responses may reflect the fact that many Wisconsin cities have community-wide programs in place that already require this type of action.) Almost as many parents would be willing to turn off the water when brushing their teeth in order to save water (89%).

Figure 3-5:
Willingness to Take Energy Conservation Action*



*Percent saying true or mostly true.

Overall, parents are very willing to take actions that would save energy.

- They place a high value on energy education. Eighty-eight percent think energy education is important.
- Parents would also feel comfortable (69%) influencing others to take environmental actions (e.g., asking them not to litter).
- Sixty-nine percent of parents would be willing to purchase one product over another because of its reusable, returnable, or recyclable packaging ("Reusing" in Figure 3-5).
- A majority of parents (57%) say they would rather wash dishes than use paper plates (thus reducing waste).

Parents are unwilling to take one action: to reduce air pollution, only 37 percent of parents were willing to walk rather than take the car.

3.4.4 Actual Commitment to Energy Conservation

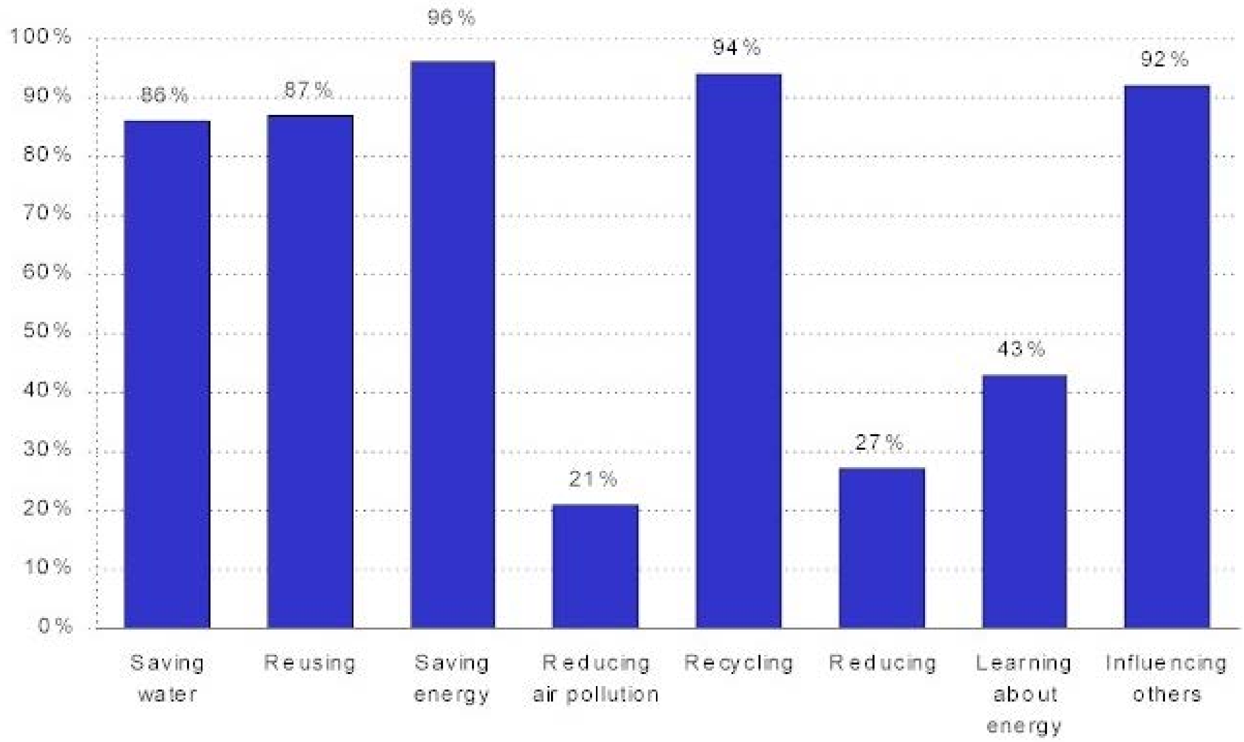
After assessing their willingness to consider the above energy conservation actions, parents were asked eight questions that assessed actual energy conservation commitments they were currently making (“actual commitment” in Table 3-5).

Since parents generally feel they have more control and power over their actions that affect energy consumption than do students, it is not surprising they have also made more commitments to conserving energy (Figure 3-6). Not only are parents more willing to take energy conservation measures, they are also more likely to be currently conserving energy in their everyday life.

- 92% of parents say they tell their children to recycle pop cans.
- Most of the parents (96%) save energy by turning off lights and appliances when not being used.
- Almost all parents (94%) report recycling by separating things at home.
- Forty-three percent of parents learn about energy by reading newspaper and magazine articles about energy issues.

Similar to the set of willingness questions above, parents were unlikely (only 21%) to walk places to do their part in helping solve air pollution problems.

Figure 3-6:
Actual Energy Conservation Commitments



3.4.5 Attitudes Towards Energy Conservation Actions and Education

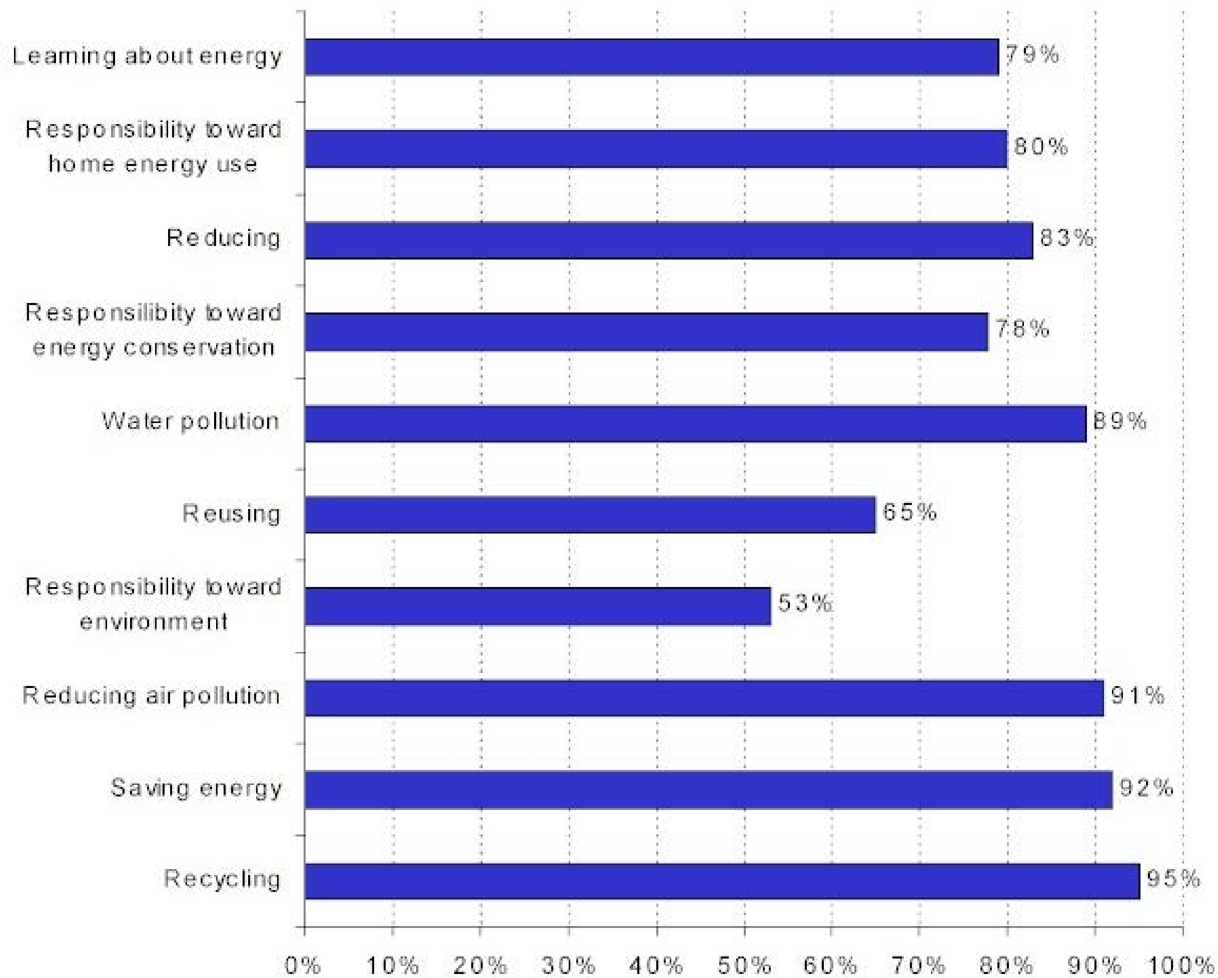
Ten statements were presented to parents to assess their attitudes toward energy conservation actions and education ("attitudes" in Table 3-5).

In general, parents have positive attitudes towards conserving energy (Figure 3-7). They feel energy conservation is worth the effort, and they tend to be more concerned about all of these issues.

- Nearly all of the parents (95%) think recycling is worth the effort.
- The majority of the parents (91%) are concerned about the effects of pollution on their family.
- A large percentage (89%) of parents are concerned about water pollution.
- Many parents are concerned about reducing waste (83%).

- Most parents (80%) feel the things their children do affect energy usage in their home.
- Many parents (79%) find it important to know about environmental problems and issues.

Figure 3-7:
Attitudes Toward Energy Conservation



CHAPTER 4
TEACHING ENERGY IN WISCONSIN

The baseline survey asked the target population of Wisconsin teachers if they currently infuse the subject of energy into their classroom curriculum, what their attitudes toward teaching energy are, how energy currently fits into their curriculum, what barriers they encounter in teaching energy, and what their initial reactions were to an energy education program. This chapter presents the key findings of the teacher baseline survey. Additional data tables containing the results of the teacher baseline survey by school district single strata, subject taught by the teacher, and the teacher's interest in an energy education program are available separately from the Energy Center.

4.1 PROFILE OF TEACHERS WHO DO AND DO NOT TEACH ENERGY

More than half (53%) of Wisconsin teachers in the target population say they currently infuse the subject of energy into their classroom curriculum. These energy teachers are generally similar to the entire target population of teachers in Wisconsin in terms of how long they have been teaching and the number of students they teach per year. But teachers of energy differ from those who do not teach energy:

- Energy teachers are slightly more likely than non-energy teachers to be rural teachers. Conversely, urban teachers are less likely than rural teachers to be including energy in their curriculum.

- Not surprisingly, science, and technical education teachers are more likely to teach energy than teachers of other subjects in the target population. Math and business teachers are the least likely to include energy in their curriculum.

- Compared to non-energy teachers, energy teachers use a greater range of teaching materials including videos, the Internet, community resources, television programs, field trips, guest speakers, and magazine and newspaper articles.

Attitudes toward teaching energy also differ between those who teach it and those who do not (Table 4-1).

- Most energy teachers (65%) feel energy education should be considered a priority in our K-12 education system.

- Many non-energy teachers (51%) feel energy should only be taught by select teachers such as science teachers.
- Not surprisingly, energy teachers are more likely to feel they have adequate training or experience in this area than non-energy teachers. However, even among energy teachers, only about one-half (56%) feel they have adequate training and experience.
- Compared to non-energy teachers, energy teachers are much more comfortable integrating energy concepts into their curriculum and using published and community resources to develop energy education lesson plans.

Table 4-1:
Attitudes Toward Teaching Energy

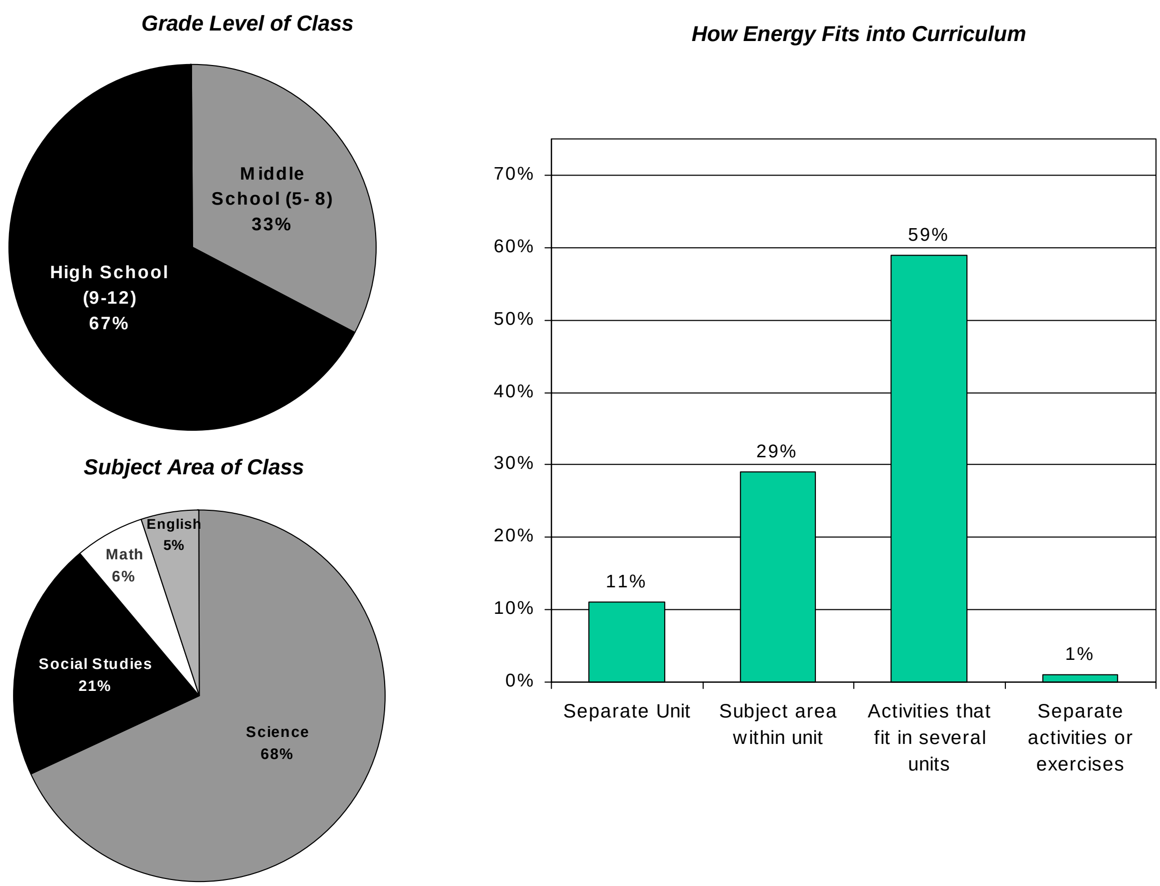
	Percent who Agree[1]	
Attitude	**Energy Teachers**	**Non-Energy Teachers**
Energy education should be a priority in our K-12 education system	65%	42%
Energy education should be taught by select teachers, such as science teachers	22%	51%
I feel I have adequate training and experience to teach about energy	55%	12%
I am comfortable with the number of published resources I can acquire to develop energy education lessons and activities	48%	14%
I am comfortable using the Internet to gain access to energy education support materials	45%	36%
I am comfortable contacting local and statewide community resources to support my efforts to teach about energy	47%	24%
I am comfortable with my ability to integrate energy concepts into my curriculum	73%	23%

[1] Percent of respondents who said strongly agree or agree on a 1 to 5 scale.
Note: For the results compared in this table the 95% confidence interval is ± 8.5%.

4.2 ENERGY'S ROLE IN THE WISCONSIN CLASSROOM

The majority of teachers in the target population who currently teach about the subject of energy in the classroom feel they provide students with a fundamental knowledge of energy (89%), help students gain skills that will allow them to manage their energy use effectively (71%), involve students in investigating positive and negative effects of energy resource development and use (69%), and promote student understanding of energy resources used in Wisconsin (60%).

Figure 4-1:
How Energy is Currently Taught



Energy teachers were asked to list the grades and subjects of classes they currently teach energy in and how energy fits into their curriculum (Figure 4-1). There is a definite pattern to how energy is taught by teachers in the target population:

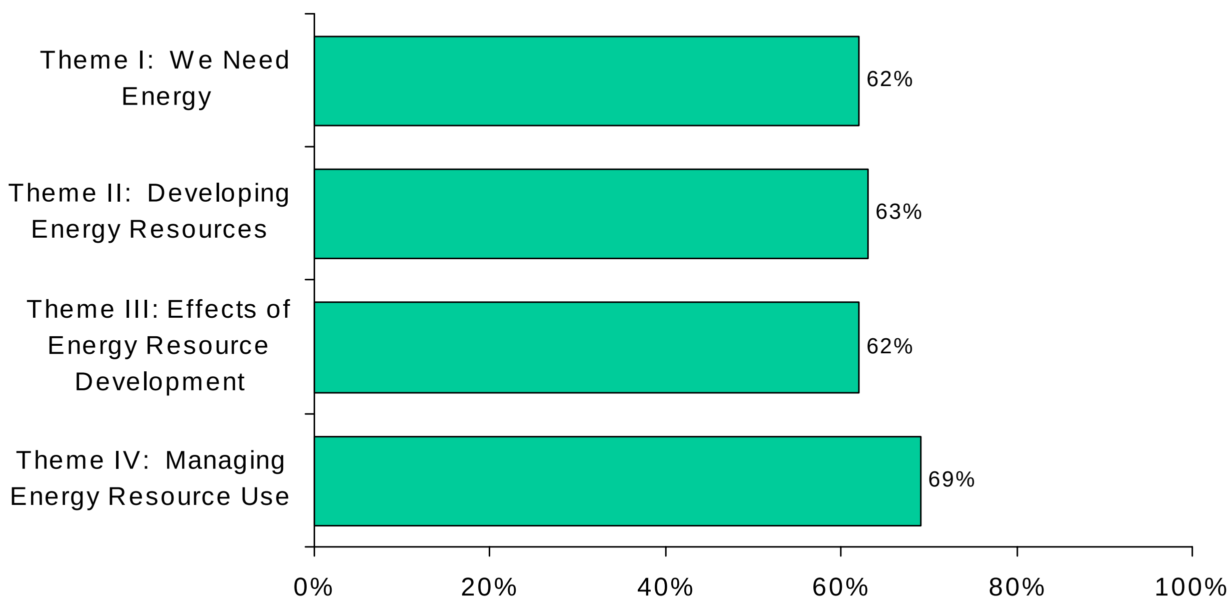
- Of the grade levels mentioned by energy teachers in the target population, 67% were at the high school level (grades 9 – 12).

- Sixty-eight percent of the subject areas listed, as taught by energy teachers in the target population, were in the sciences. Some social studies classes were listed (21%), but English or math classes were rarely listed (6% and 4%, respectively) as classes that energy is taught in.

- Most teachers in the target population who include energy in their curriculum teach energy activities or exercises in many units throughout the year (59%). Some teach it as one area within a larger unit (29%), while others teach it as a completely separate unit (11%).

In order to assess the impact of the KEEP program in the future, energy teachers were asked in the baseline survey if they taught the four KEEP energy themes (Figure 4-2). Although the majority of energy teachers (62% or more) teach all four energy themes, a slightly larger percentage (69%) teach Theme IV: Managing Energy Resource Use.

Figure 4-2:
Energy Themes Taught by Teachers Who Teach Energy



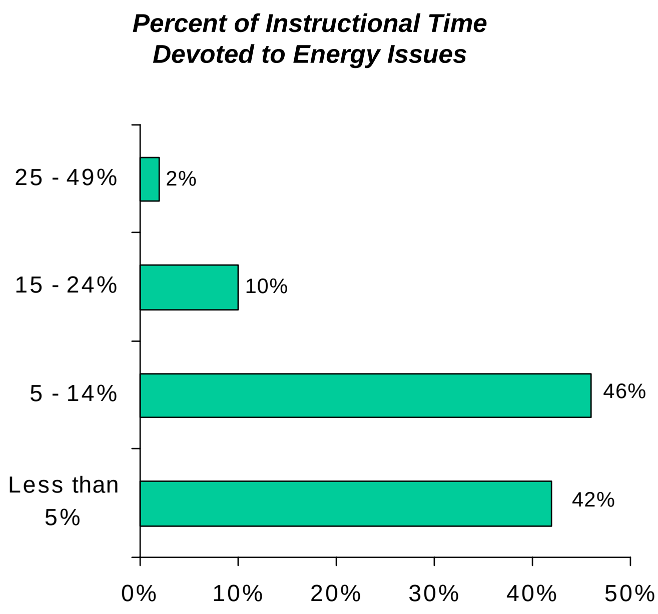
Energy teachers tend to spend only a small proportion of their instructional time teaching about energy issues, but they use a wide variety of teaching materials (Figure 4-3):

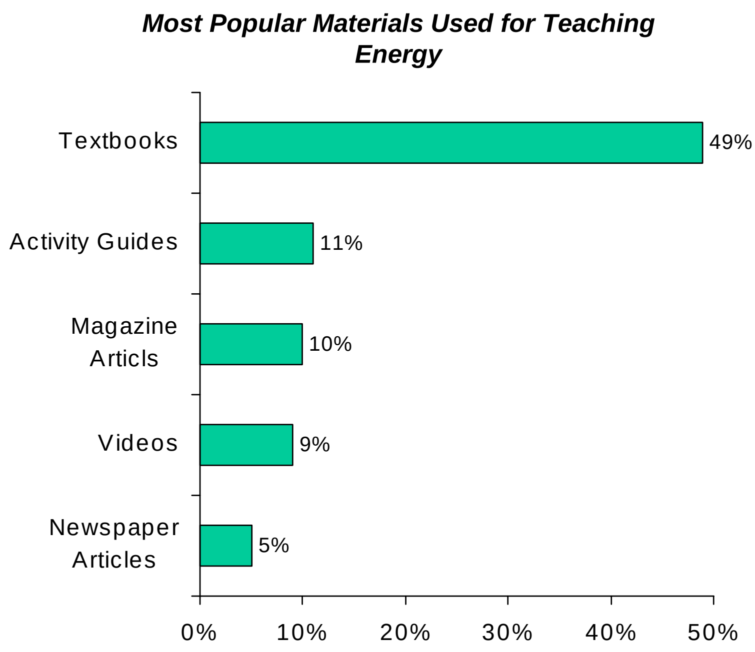
- Forty-two percent of the energy teachers devote less than 5% of their instructional time to energy concepts. Forty-six percent devote 5 – 14% of their instructional time, 10 percent devote 15 – 24% of their instructional time and only 2 percent devote 25 – 49% of their instructional time to energy concepts.

- Textbooks are the primary material used to teach energy.

- Videos, magazine and newspaper articles, and novels are also used by teachers to teach energy. Rural energy teachers are more likely to use curriculum guides, activity guides, and the Internet to teach about energy, while urban energy teachers are more likely to use guest speakers and community resources.

Figure 4-3:
Teaching Energy — Instructional Time Spent and Materials Used

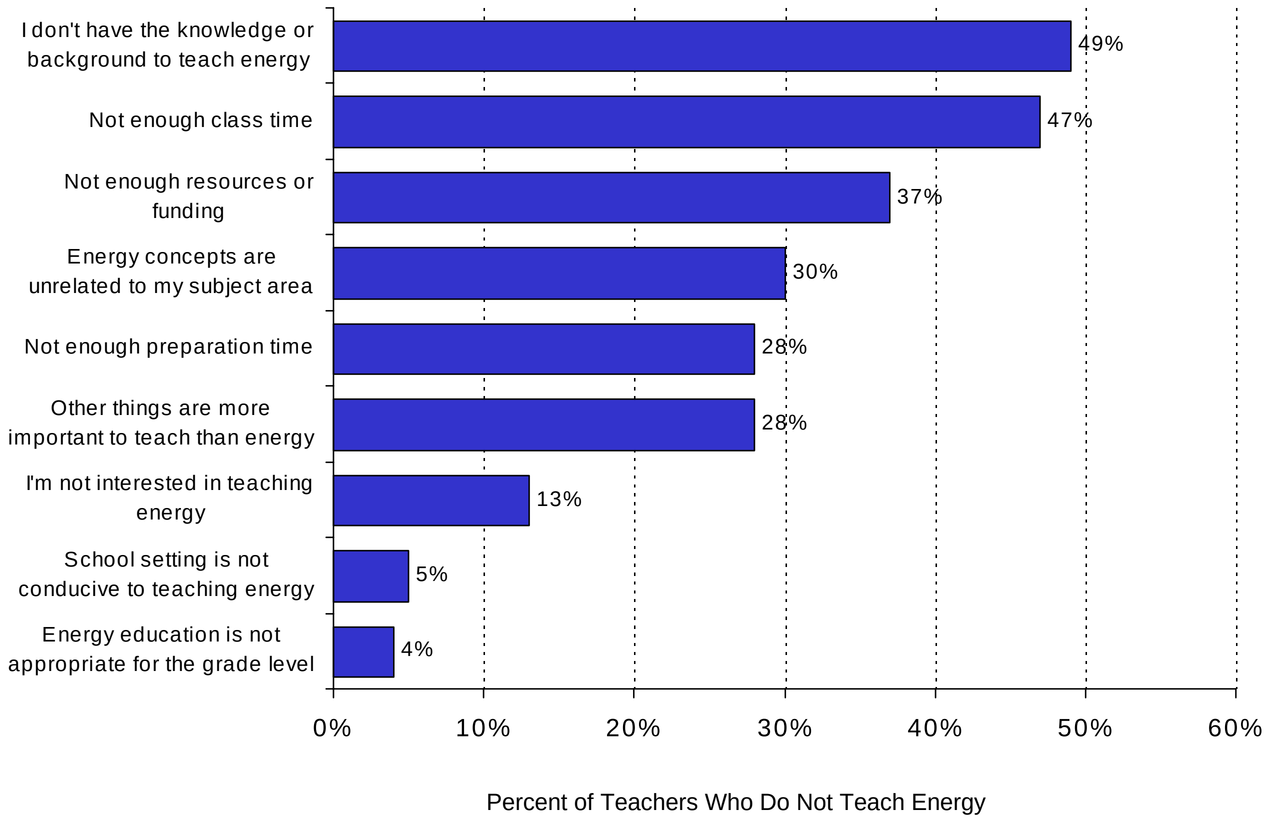




4.3 BARRIERS TO TEACHING ENERGY

Forty-seven percent of Wisconsin teachers in the target population currently do not teach their students about energy. The primary reasons cited by these teachers for not teaching about energy include (1) teachers do not have the knowledge or background to teach this subject area, (2) they do not have enough class time, (3) there are not enough resources or funding available to them, and (4) energy concepts are unrelated to their subject area (Figure 4-4).

Figure 4-4:
Barriers to Teaching Energy



The two things that would have the largest influence on encouraging these teachers to include energy in their curricula would be better access to resources and aids for teaching about energy (42%) and more in-service classes on energy education teaching methods (20%). Other situations that may influence them are more class time, more preparation time, or understanding how energy was applicable to the subject they teach.

4.4 INITIAL REACTION TO ENERGY EDUCATION PROGRAM

All teachers in the baseline survey were given a brief description of a generic energy education program based on the concepts of KEEP (Exhibit 4.1). The KEEP program was not mentioned by name. Teachers were then asked for their opinion on the advantages and disadvantages of such a program, their interest in attending a training for this type of program, their timeline for incorporating an energy education program into their curriculum, and the importance of teaching students some specific energy concepts.

Exhibit 4-1:
Description of Energy Education Program from Baseline Survey

For the next set of questions, please assume that you have been invited to participate in a program created to promote energy education in Wisconsin. Below, we have briefly described what a typical energy education program might look like. CEUs and tuition waiver would be available to certified, practicing K-12 teachers in Wisconsin school districts who participate in the program.

Mission: To initiate and facilitate the development, dissemination, implementation, and evaluation of energy education programs within Wisconsin Schools.

How: Through hands-on activities and class discussions, this program would assist teachers in enhancing students' understanding of what energy is, where it comes from, and how it affects their lives. Teachers would receive a copy of a comprehensive, easy-to-use activity guide as well as other energy related materials.

Concepts: The activity guide and other energy-related material would be organized around the following four themes:

- *We Need Energy*. Defines energy, lists its sources and forms, and describes how energy is transferred and converted from one form to another according to the laws of thermodynamics, and explains how energy flows through living and nonliving systems.
- *Developing Energy Resources.* Addresses the sources of energy and how humans, through technology, use energy to meet societal wants and needs. It also shows how humans have come to treat energy as a resource.
- *Effects of Energy Resource Development.* Covers how using energy resources affect human societies and the environment.
- *Managing Energy Resource Use.* Identifies strategies to help resolve many of the issues related to energy resource developments. Also discusses how today's energy-related decisions and actions influence the future availability of energy resources.

4.4.1 Advantages and Disadvantages of the Energy Education Program

According to Wisconsin teachers, the main advantages of the energy education program described to them in the survey are primarily related to raising the level of energy awareness:

- The energy education program would increase students energy awareness (52%).

- Significant percentages also thought the program would be user friendly and could be tailored to any grade level (15%) , and that it "sounded good" and would be a good resource (10%).

Other advantages cited by smaller percentages of teachers include: the program would be a time-saver; it would increase the chance that energy concepts would be taught; it would enhance the content of the class; and it would be free. Seventeen percent of teachers saw no advantages to the energy education program.

Disadvantages of the energy education program were mentioned as well. According to teachers the main disadvantages are that:

- They already have too much to teach in their subject areas (20%).
- It would be difficult to incorporate the program into their curriculum (13%).

Other disadvantages mentioned by smaller percentages of teachers include: they would be pushing a utility agenda; it would take time away from more important curriculum; it would be expensive; a more creative program is needed; it would be difficult for the students to understand; teachers may not take the time to attend a training; parents would not support such a program; students would not be interested; and there are already a lot of other energy programs available. Fifty-three percent of teachers saw no disadvantages to the energy education program.

4.4.2 Interest in Attending a Training for the Energy Education Program

Teachers were evenly split in their interest in attending a training for the energy education program (Figure 4-5). Thirty percent of teachers were interested in attending a training for the program (a rating of 8 – 10), 37 percent were neutral (a rating of 4 – 7), and 33 percent were not interested in attending the training (a rating of 1 – 3).

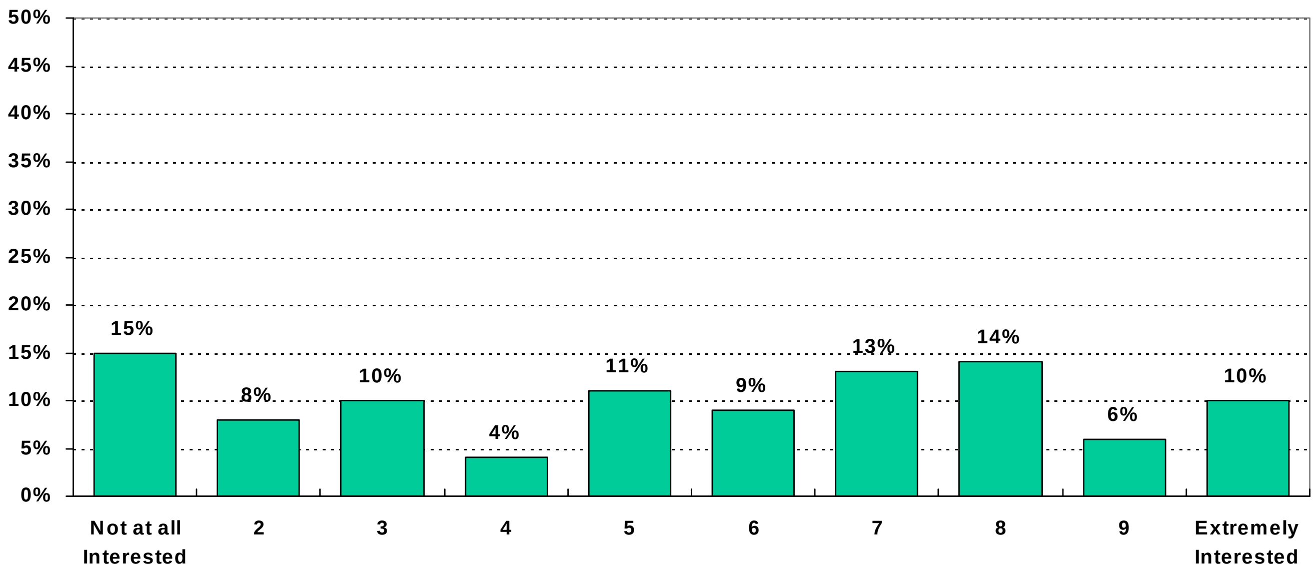
Teachers who were interested in attending the training were mainly interested because:

- They wanted to learn more about teaching energy (40%).
- They believe teaching energy is important (33%).
- They thought the program could be incorporated into their coursework (13%).

Teachers who were not interested in the training said:

- They had other priorities (46%).
- Energy education was not in their subject area (29%).
- They had a busy schedule with little time for training (23%).

Figure 4-5:
Interest in Attending a Training for the Energy Education Program



If teachers were to attend the energy education program training, a majority said they would likely incorporate the energy activities and materials into their classroom teaching by the following semester. Fourteen percent of teachers would incorporate the information immediately; 33 percent would incorporate it sometime in the current semester; 11 percent would incorporate it in the following semester; 29 percent would incorporate it in the following school year; and 13 percent would not incorporate the energy activities or materials in the current school year or the following school year.

4.4.3 Importance of Energy Education Concepts

Teachers in the baseline survey were then asked to rate the importance of 11 energy topics which corresponded to the four KEEP energy themes. Although the majority of teachers feel it is important for students to learn all four energy themes, Themes II, III, and IV are perceived as more important than Theme I (Table 4-2).

Table 4-2:
Importance of Teaching Major Energy Themes

Energy Theme	Percent of Teachers who Feel at Least One Topic in Theme is Important[1]
Theme I: We Need Energy	76%
Theme II: Developing Energy Resources	82%
Theme III: Effects of Energy Resource Development	84%
Theme IV: Managing Energy Resource Use	83%

[1] Percent of teachers who gave a rating of 8, 9, or 10 on a 10-point importance scale.

The majority of teachers felt that most of the individual energy topics were important for students to learn, but a few topics did get lower overall importance ratings (Table 4-3). The natural laws that govern energy; discussing energy resource use and management with family members; and learning how living systems use energy were considered less important for students to learn. The highest importance ratings were given to learning how current energy use practices affect the quality of the environment and the health of organisms living in the environment; identifying actions that could be taken to better manage energy resource use; and learning how the world around us depends on a continuous supply of energy.

Table 4-3: Importance of Teaching Specific Energy Topics

Energy Topics	Percent of Teachers Who Feel Energy Topic is Important[1]	Rating[2]
Theme I: We Need Energy		
What energy is and where it comes from	70%	8.21
The natural laws that govern energy	55%	7.52
How living systems use energy	68%	8.08
Theme II: Developing Energy Resources		
The world around us depends on a continuous supply of energy	78%	8.56
How humans have used technology to further their ability to use energy	74%	8.34
How supply and demand influence energy resource development and use	74%	8.23
Theme III: Effects of Energy Resource Development		
How energy use affects the quality of human life	77%	8.51
How current energy use practices affect the quality of the environment and the health of organisms living in the environment	83%	8.80
Theme IV: Managing Energy Resource Use		
How to identify actions that could be taken to better manage energy resources	77%	8.63
How scientific, technological and social changes will influence future energy resource availability	78%	8.45
To discuss energy resource use and management with family members	66%	8.00

[1] Percent of teachers who gave a rating of 8, 9, or 10 on a 10-point importance scale.
[2] Average rating on a 10-point importance scale.

4.5 IMPLICATIONS FOR EDUCATION POLICY IN WISCONSIN

The lack of class time and teacher preparation time is a significant barrier to energy education in Wisconsin. Most teachers who currently teach energy concepts include energy topics in various subject units throughout the year. These energy topics and concepts are typically taught in science class. However, the great majority of the teachers who currently teach energy report that only a small amount of instructional time (less than 10 percent on an annual basis) is devoted to energy topics or concepts. Among the teachers who do *not* currently teach energy, lack of class time is one of the major barriers cited for not teaching energy concepts.

Because class time is already limited, it seems unlikely that a strategy of encouraging schools and teachers to incorporate energy topics and concepts as a stand-alone subject will be successful in increasing the amount of class time devoted to energy education. Instead, encouraging energy topics and concepts to be included in a wider variety of classes, such as social studies, business, and family and consumer science, in addition to science class, appears to be a more promising strategy. This will require less direct "head-to-head" competition with other subjects for class time. The diffusion of energy topics and concepts into other subject areas will increase the total amount of instruction time without having to displace other topics and units that are currently taught.

A policy that encourages energy topics and concepts to be included in subjects such as social studies, business, or family and consumer science, may help to alleviate some of the direct competition for class time. However, it will require additional resources and funding to educate teachers of these subjects about energy concepts and the relevance of energy topics in their subject area. Only about one-half of the teachers who currently teach energy feel they have sufficient background and experience with energy concepts and topics. Among teachers who do not currently teach energy, only about 10 percent feel qualified to do so. Increasing the diffusions of energy concepts and topics among subject areas will require energy education programs aimed at teachers, as well as additional classroom materials and resources more focused on assisting them in incorporating energy topics and concepts into their specific subject areas. The materials developed for the KEEP program could be expanded and reorganized to include more specialized materials for use in each of the appropriate subject areas. For example, the following are just some of the topics or concepts that could be incorporated into appropriate units in other classes:

- Deregulation of the electric and gas utility industries could be studied to illustrate principles of monopolistic and competitive markets and the issues involved in regulation for the public good.
- The impact of energy policy on low-income households and other subgroups of the population could be a topic for a social studies class to illustrate.

- Managing household budgets including examining monthly energy costs and optional conservation practices could be incorporated into a unit for family and consumer sciences.

Implementation of this policy would require additional research with curriculum planners and teachers of related subjects to explore and verify the relevance of energy topics and concepts for different subjects, as well as specific units in which energy topics and concepts could be incorporated.

CHAPTER 5
COMPARISON OF STUDENTS AND PARENTS

This chapter compares parents' and students' answers in four areas of energy education: current energy knowledge; discussions of energy in the home; interest in energy-related topics; and commitment/attitudes toward energy conservation and education.

5.1 COMPARISON OF CURRENT ENERGY KNOWLEDGE

As Chapters 3 and 4 described, 24 multiple choice questions were used to assess the current level of energy knowledge among students and parents. Each of the 24 knowledge questions was selected to correspond to one of the four KEEP energy themes. Parents and 7th – 12th graders were asked exactly the same questions in this part of the survey. Fourth through sixth graders were asked some of the same questions as well as some similar but less complicated questions.

5.1.1 Overall Knowledge Scores

To provide a reliable measure of each theme, an index was created that measured the number of correct answers to all of the questions for a particular theme. For each respondent, calculating the percentage of correct answers for that theme created a theme knowledge score.

The overall knowledge scores in Figure 5-1 indicate that Wisconsin parents are more knowledgeable about energy than their children. They are most knowledgeable about Theme IV (Managing Energy Resource Use). However, both parents and students are only somewhat knowledgeable about energy in general.

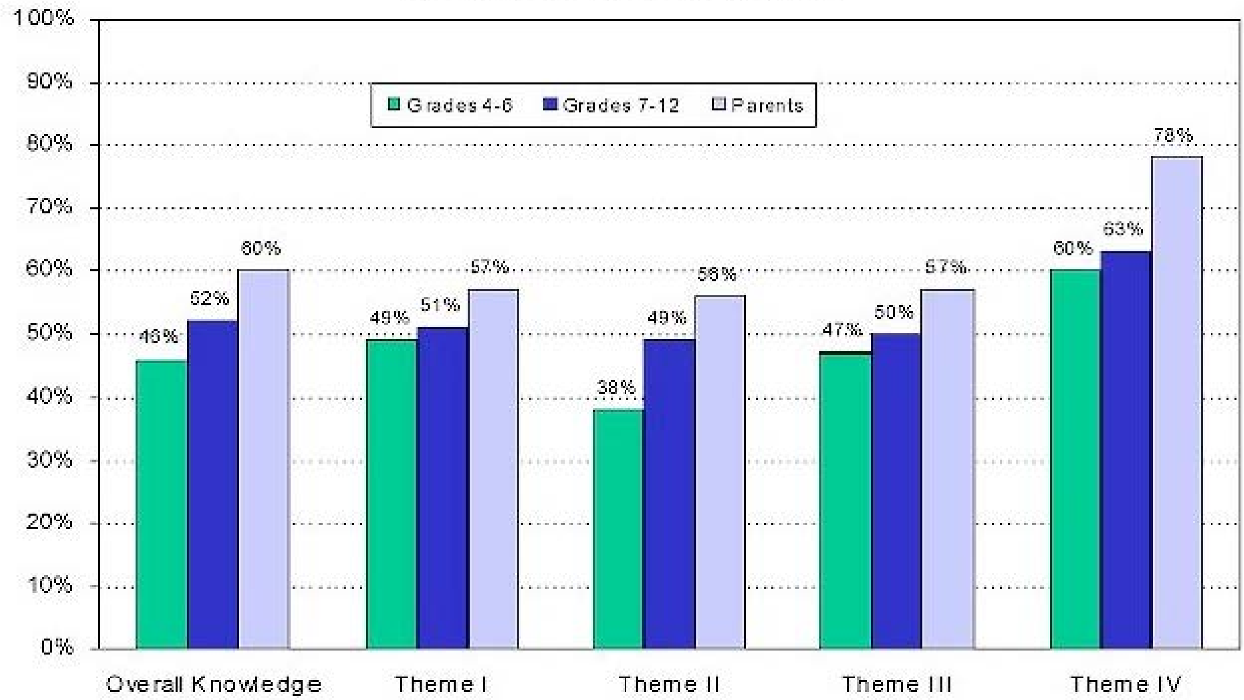
- Parents scored higher than students in Theme I (We Need Energy) (57%). Lower and higher grades had about the same scores on all the questions in this module (49% and 51%, respectively).

- Both parents and students had the lowest scores for Theme II (Developing Energy Resources). 4th – 6th graders only answered 38% of the questions correctly; 7th – 12th grade students answered 49% correctly; and parents answered 56% correctly.

- Knowledge of Theme III (Effects of Energy Resource Development) was almost identical to Theme I above. 4th – 6th graders answered less than half of the questions correctly (47%); 7th – 12th graders answered half correctly; and parents answered 57% of the questions correctly.

- Theme IV (Managing Energy Resource Use) is the best known among Wisconsin's students and parents. Both younger and older students answered most of the questions in this module correctly (60% for lower grades and 63% for higher grades). Parents scored the highest in this theme (they answered 78% of the questions correctly).

Figure 5-1:
Overall Knowledge Score by Theme



5.1.2 Knowledge of Specific Energy Questions

Wisconsin parents' and students' knowledge of specific questions within a theme varied (Table 5-1). Compared to students, parents are more knowledgeable about almost all of these basic concepts and issues.

Theme I—We Need Energy

- A high percentage of parents answered correctly when asked what happens to light bulb energy that is not spent in producing light and how energy flows through living systems (81% for both questions). For 7^{th} – 12^{th} graders, 53% answered the first question correctly and 74% answered the second one correctly. Younger students, who were also asked the second question, answered as many correctly as the older students (73% answered correctly).

- Younger students scored higher than everyone else on a question that asked about the earth's primary source of energy (63% correct versus 56% for older students, and 58% for parents).

- Only a third of the parents correctly answered a question on the laws governing energy (31%), and 7^{th} – 12^{th} graders scored even lower on this same question (23%).

- Compared to both parents and older students, younger students were somewhat less knowledgeable about complex concepts such as the dynamics of food chains and the definition of conduction (radiation for older students/parents).

Theme II—Developing Energy Resources

- Almost all parents correctly answered that the sun is a source of energy for humans (90%). A high percentage of the 7^{th} – 12^{th} graders also knew this (73%), but only 44% of the younger students answered correctly.

- The majority of parents knew about renewable energy resources (82%). Seventy percent of 7^{th} – 12^{th} graders also answered this question correctly. This compares to only 38% of younger students.

- But few parents or older students knew that energy currently present can change forms but not be destroyed (only 23% for parents and 32% for students).

- In addition, most parents and students did not know that wood is the primary renewable energy source in Wisconsin (36% of younger students, 32% of older students, and 33% of parents).

- Overall, the younger students were less familiar than parents or older students with the questions in this module.

Theme III—Effects of Energy Resource Development

- The majority of parents knew that nuclear power plants produce less air pollution (81% answered correctly compared to 66% of 7^{th} – 12^{th} graders).

- About two-thirds of both parents and older students correctly answered two other questions in this module: the relationship between coal burning and air pollution (68% and 65%, respectively) and the effect of acid rain (65% and 63%, respectively).

- Only a few parents or students knew that ozone is the most prevalent air pollutant in Wisconsin.

Table 5-1:
Specific Energy Knowledge Questions

	Percent Answering Correctly		
	4th – 6th grade students (n = 317)	**7th – 12th grades students (n = 514)**	**Parents (n = 440)**
Theme I: We Need Energy			
(Q1) Earth's primary source of energy*	63%	56%	58%
(Q3) Properties of energy	80%	53%	81%
(Q4) Producers and consumers/energy properties	37%	23%	31%
(Q5) Food energy flows in living systems*	73%	74%	81%
(Q6) Dynamics of food chains	32%	51%	62%
(Q7) Definition of conduction/radiation	12%	47%	43%
(Q20) Difference between mechanical, kinetic, potential energy*	43%	50%	46%
Theme II: Developing Energy Resources			
(Q2) Identification of a nonrenewable energy resource*	38%	70%	82%
(Q11) Definition of fossil fuels/properties of energy	37%	32%	23%
(Q12) More nonrenewable energy sources	38%	50%	55%
(Q14) Primary energy sources for heating homes	42%	50%	64%
(Q15) Sources of energy for human use*	44%	73%	90%
(Q17) Energy sources for electricity/air pollutants	49%	NA	NA
(Q21) Potential energy/process of photosynthesis	28%	37%	43%
(Q22) Definition of electric current*	29%	51%	57%
(Q24) Wisconsin's primary renewable resource*	36%	32%	33%
Theme III: Effects of Energy Resource Development			
(Q8) Greenhouse effect/acid rain contributors	50%	50%	63%
(Q9) Coal burning and air pollution*	46%	65%	68%
(Q10) The effect of acid rain*	46%	63%	65%
(Q13) Nuclear power plants and air pollution*	48%	66%	81%
(Q17) The most prevalent air pollutants in WI	NA	6%	10%
Theme IV: Managing Energy Resource Use			
(Q16) The long-term availability of solar energy*	79%	88%	93%
(Q18) The future of oil supplies*	60%	79%	85%
(Q19) Conservation as a solution to shortage	50%	38%	62%
(Q23) Current state of solid waste disposal	52%	48%	71%

*Question wording the same across all students and parents.

Theme IV—Managing Energy Resource Use

- Most parents knew about the long-term availability of solar energy (93%); the likely shortages of oil supplies in the 21^{st} century (85%); how solid waste is currently disposed of (71%); and that conservation was a solution to resource shortages (62%).

- Both younger and older students scored high in this module. Most students knew about the long-term availability of solar energy (79% and 88% of younger and older students, respectively) and the likely shortage of oil in the 21^{st} century (60% and 79%).

- They were less likely to know that conservation is a solution to shortage (50% and 38%) or about the current state of solid waste disposal (52% and 48%).

As stated in Chapters 2 and 3, the reader should keep in mind that it is difficult to put the current state of student and parent energy knowledge into perspective in the absence of a benchmark or standardized scores. Not only were the questions relatively difficult, but to meet the criteria of a benchmark study, they also had to cover a broad range of energy knowledge. As a result, it is not unexpected that the average percentage of correct scores on the energy knowledge quiz were in the 40–60 percent range for both students and parents.

5.2 DISCUSSIONS OF ENERGY IN THE HOME

Nearly all (97%) of the parents surveyed in the baseline survey said they had talked with their children about saving energy around the home—e.g., shutting off lights when not in use, turning down the heat, or closing doors and windows. Of these, 76 percent said this topic came up at least once a month. Energy expenses—e.g., the size of the electricity or home heating bill or the cost of gasoline for the car—was also a familiar topic in Wisconsin homes (91% had talked about this with their children). This topic also came up frequently (76% of the parents said they discussed this at least once a month with their children).

The large majority of younger students remembered these conversations. Seventy-nine percent of 4^{th} – 6^{th} grade students whose parents filled out a survey said their family had talked about saving energy around the home. Of these, 61 percent remembered these conversations occurring at least once a month. Eighty percent also said their family talked about energy expenses. Of these, 59 percent said this type of energy-related conversation occurred at least once a month.

Almost the same percentages of older students whose parents filled out a survey also remembered energy saving/cost conversations. Seventy-nine percent said their family had discussed saving energy around the house; 57 percent of these thought that conversation had occurred at least once a month. Eighty-seven percent of the older students said they had also talked with their family about energy expenses. Of these, 59 percent reported this conversation took place at least once a month. Chapter 4 discusses the possible correlation between parents' energy knowledge and their child's energy knowledge and attitudes.

5.3 INTEREST IN ENERGY-RELATED TOPICS

One key objective of the baseline survey was to find out what energy topics Wisconsin students were interested in studying and which ones parents thought were important for their child to study. The same 12 questions that were used to determine whether students had studied the four KEEP energy themes were used to assess interest in these themes. Parents and 7th – 12th graders were asked the same questions; 4th – 6th graders were asked different but comparable questions.

Overall, most parents are interested in having their child study energy topics at school, and a majority of students are interested in learning about energy at school. Almost all of the parents (99%) said they would find value in activities at school that taught their child about the nature of energy, how it is used, and ways in which energy use affects the environment. Seventy-four percent of the students reported they would find these types of energy activities "okay" or "exciting."

5.3.1 Interest in Studying Energy Themes

The great majority of parents thought all the themes were important for their child to study; 85 percent or more rated at least one concept in the theme as a 4 or 5 on a 5-point importance scale (Table 5-2). The majority of younger students were also interested in all four themes. In this age group, the exception was Theme IV (Managing Energy Use Resource), where only 56% of younger students rated one or more concepts as somewhat or very interesting. Older students were less interested than younger students in studying three of the themes. The exception to this was Theme III, where fairly high percentages of both older and younger students rated at least one concept as interesting (71% for younger and 70% for older).

Table 5-2: Interest in Studying Energy Themes

	Rate One or More Concept Important[1]	Interested in One or More Concept[2]		
Energy Theme	**Parents (N = 440)**	**All Students (n = 821)**	**4th – 6th grade students (n = 307)**	**7th – 12th grade students (n = 514)**
Theme I: We Need Energy	85%	60%	70%	54%
Theme II: Developing Energy Resources	88%	59%	65%	56%
Theme III: Effects of Energy Resource Development	93%	70%	71%	70%
Theme IV: Managing Energy Resource Use	85%	56%	56%	55%

1 Parents who rated one or more concept in the theme as a 4 or 5 on a 5-point importance scale.
2 Students who rated one or more concept in the theme as a 4 or 5 on a 5-point interest scale.

Parents tended to be more interested in the specific topics than students were.

In Theme III—the most popular theme among all respondents—students of all ages were the most interested in learning how energy use affects the environment (Table 5-3). This topic was also rated as important for children to study by 88 percent of the parents. But several of the other topics received relatively low ratings by students and parents. Topics having to do with the cost of energy, energy use throughout history, and the pros and cons of public versus private transportation were of much less interest than topics related to broader energy and environmental issues.

Table 5-3: Interest in Specific Energy Topics – Theme III

	Percent Rating Topic Important[1]	**Percent Interested in Topic**[2]	
	Parents (n = 440)	**4^{th} – 6^{th} Grade Students (n = 307)**	**7^{th} – 12^{th} Grade Students (n = 514)**
Theme III: The Effects of Energy Resource Development			
4^{th} – 6^{th} Grade Version			
How much it costs each year to run refrigerators and other appliances		39%	
The pros and cons of using public transportation versus private travel		29%	
How to safely use electricity around the home		40%	
How energy use affects the environment		51%	
7^{th} – 12^{th} Grade Version			
How energy prices are determined	66%		35%
What can be done to address air pollution	88%		44%
The kinds of energy used at earlier times in history	47%		36%
How energy use affects the environment	88%		44%

[1] Parents who rated the topic as a 4 or 5 on a 5-point importance scale.
[2] Students who rated the topic as a 4 or 5 on a 5-point interest scale.

How energy is transferred between organisms in a food chain and the contribution of sun, wind, and water to the energy cycle are the topics in Theme I that are the most interesting to the younger students (Table 5-3). Why energy can neither be created nor destroyed is the favorite topic in this theme among 7th – 12th graders. Seventy-three percent of the parents also found this latter topic important for their child to study.

Table 5-4:
Interest in Specific Energy Topics – Theme I

	Percent Rating Topic Important[1]	**Percent Interested in Topic[2]**	
	Parents (n = 440)	**4th – 6th Grade Students (n = 307)**	**7th – 12th Grade Students (n = 514)**
Theme I: We Need Energy			
4th – 6th Grade Version			
What energy is and where it comes from		36%	
Identifying forms of potential and kinetic energy		32%	
How energy is transferred between organisms in a food chain		40%	
The contribution of sun, wind, and water to the energy cycle		45%	
7th – 12th Grade Version			
How much energy is stored in foods	50%		19%
How the sun's energy travels through organisms	55%		24%
Why energy can neither be created or destroyed	73%		36%
How some energy becomes unavailable with each energy conversion	70%		27%

[1] Parents who rated the topic as a 4 or 5 on a 5-point importance scale.
[2] Students who rated the topic as a 4 or 5 on a 5-point interest scale.

Students found the topic of how electric circuits work and the advantages and disadvantages of nuclear energy an interesting topic to study in Theme II (55% of 4th – 6th graders and 53% of 7th – 12th graders). How motors and generators work to make electricity and what products and materials are made from fossil fuels were of less interest (Table 5-4).

Table 5-5:
Interest in Specific Energy Topics – Theme II

	Percent Rating Topic Important[1]	**Percent Interested in Topic[2]**	
	Parents (n = 440)	**4th – 6th Grade Students (n = 307)**	**7th – 12th Grade Students (n = 514)**
Theme II: Developing Energy Resources			
4th – 6th Grade Version			
What products and materials are made from fossil fuels		46%	
How electric circuits work		55%	
7th – 12th Grade Version			
The advantages and disadvantages of nuclear energy	85%		53%
How motors and generators are used to meet energy needs	72%		36%

[1] Parents who rated the topic as a 4 or 5 on a 5-point importance scale.
[2] Students who rated the topic as a 4 or 5 on a 5-point interest scale.

In Theme IV, less than half of the students said they would be interested in studying how to save energy in their home (46% of younger students) or how solar and wind energy could be used in their home (48% of older students) (Table 5-5). In contrast, a large majority of parents thought the latter topic was important for their child to study (81%).

Table 5-6:
Interest in Specific Energy Topics – Theme IV

	Percent Rating Topic Important[1]	Percent Interested in Topic[2]	
	Parents (n = 440)	**4th – 6th Grade Students (n = 307)**	**7th – 12th Grade Students (n = 514)**
Theme IV: Managing Energy Resource Use			
4th – 6th Grade Version			
How to save energy in your home		46%	
How business and industry can save energy		40%	
7th – 12th Grade Version			
How solar and wind energy could be used in your home	81%		48%
Career opportunities associated with energy development and use	71%		31%

[1] Parents who rated the topic as a 4 or 5 on a 5-point importance scale.
[2] Students who rated the topic as a 4 or 5 on a 5-point interest scale.

In general, students and parents both report higher levels of interest in broad topics (such as the role of energy in the environment, or the role of sun, wind, and water in the energy cycle) that help them to place energy in the context of issues. Some of the more specific energy topics, such as how electric motors work or how business and industry can save energy, require more specialized interest and aptitude. Consequently, a smaller proportion of students and parents expressed an interest in these topics. Energy education topics and concepts that are incorporated into other subject areas, such as social studies, business, or family and consumer science, should focus on the broader context of energy issues and how energy is related to key issues in each of these subjects. Discussions of energy in this broader context may help to increase the "relevance" of energy topics and may spark increased student interest in additional energy topics during their school careers.

5.4 COMMITMENT TO ENERGY CONSERVATION AND EDUCATION

Students and parents were asked several questions to find out what they would (or would not be) willing to do to save energy (*verbal* commitment to conservation actions and education), what energy conservation and education actions they had already taken (*actual* commitment to conservation), and their *attitudes* toward conservation actions and education. The questions were designed to measure 11 concepts related to energy conservation and education: (1) saving water, (2) saving energy, (3) reducing air pollution, (4) reusing materials, (5) reducing consumption of materials, (6) recycling, (7) learning about energy, (8) influencing others to take energy conservation action, (9) personal responsibility toward energy conservation, (10) personal responsibility toward the environment, and (11) personal responsibility toward home energy use. See Tables 2-13 and 2-14 in Chapters 2 and 3 for the survey questions that measured these concepts among parents and students.

5.4.1 Verbal Commitment to Energy Conservation

The baseline survey asked parents and students to indicate their willingness to take eight specific actions that were directly and indirectly related to energy conservation. They rated these willingness-to-take-action questions by indicating whether the statement was very true, mostly true, not sure, mostly false, or very false for them individually.

The vast majority of both parents and students say they would be willing to take waste recycling and water conservation actions (Figure 5-2). Almost all of the parents (95%) and students (85% of 4^{th} – 6^{th} graders and 90% of 7^{th} – 12^{th} graders) say they would be willing to recycle. (However, for this question, it is important to note that these responses may reflect the fact that many Wisconsin cities have community-wide programs in place that already require this type of action.) Almost as many parents and students would be willing to turn off the water when brushing their teeth in order to save water (89% of parents, 89% of 4^{th} – 6^{th} graders, and 85% of 7^{th} – 12^{th} graders).

Overall, parents are more willing than their children to commit to actions that would save energy.

- Parents place a higher value on energy education than do students. Eighty-eight percent of parents think energy education is important, while 56 percent of 4^{th} – 6^{th} grade students and only 30 percent of 7^{th} – 12^{th} grade students are interested in learning about energy.

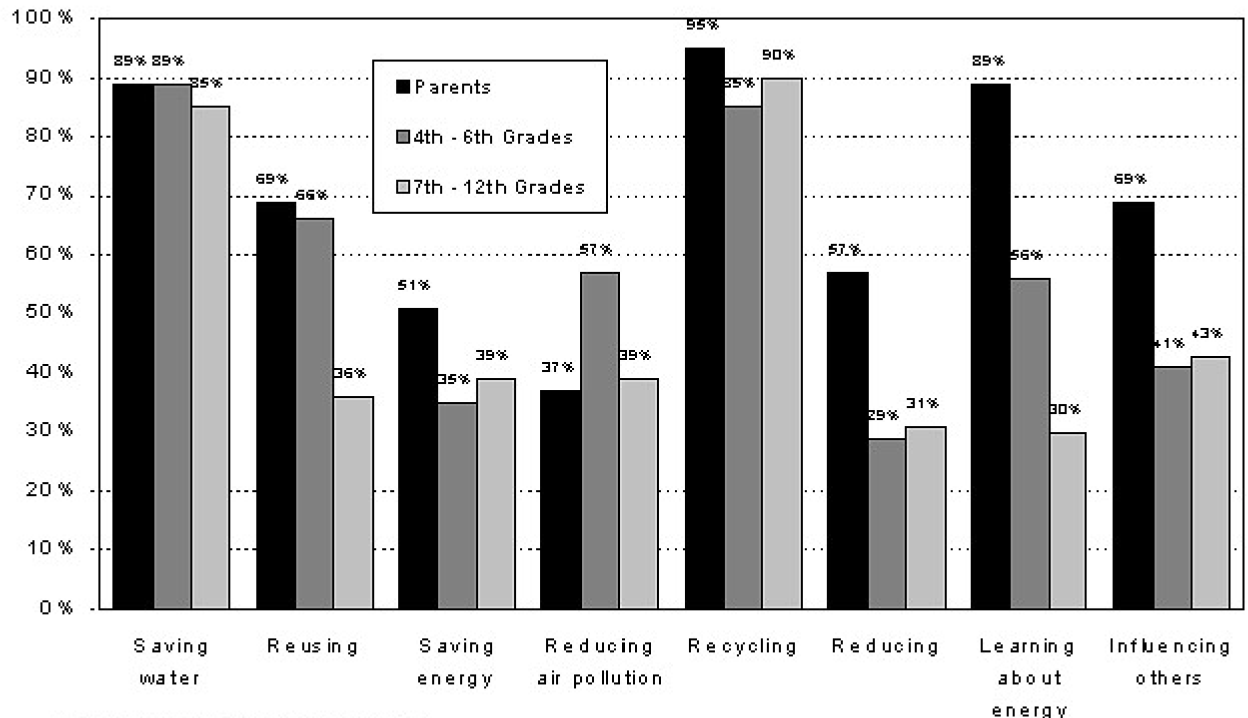
- Parents would also feel more comfortable (69%) influencing others to take environmental actions (e.g., asking them not to litter) than would students (41% of 4^{th} – 6^{th} graders and 43% of 7^{th} – 12^{th} graders).

- Sixty-nine percent of parents would be willing to purchase one product over another because of its reusable, returnable, or recyclable packaging (“Reusing” in Figure 3-5).

This compares to 66 percent of 4th – 6th grade students and only 36 percent of 7th – 12th grade students who would be willing to do the same.

- A majority of parents (57%) say they would rather wash dishes than use paper plates (thus reducing waste). Only 29 percent of 4th – 6th grade students and 31 percent of 7th – 12th grade students would do the same.

Figure 5-2:
Willingness to Take Energy Conservation Action*



*Percent saying very true or mostly true.

Students are more willing than parents to take one action. To reduce air pollution, students are more willing to walk, ride their bike, or take the bus rather than use the car (66% of 4^{th} – 6^{th} grade students and 39 percent of 7^{th} – 12^{th} grade students compared to 37 percent of parents). Younger students are more willing than older students to take several conservation actions.

- Younger students are more willing (66%) to reuse than are older students (36%).
- In addition, younger students are willing to spend more time learning about energy (56%) than older students (30%).

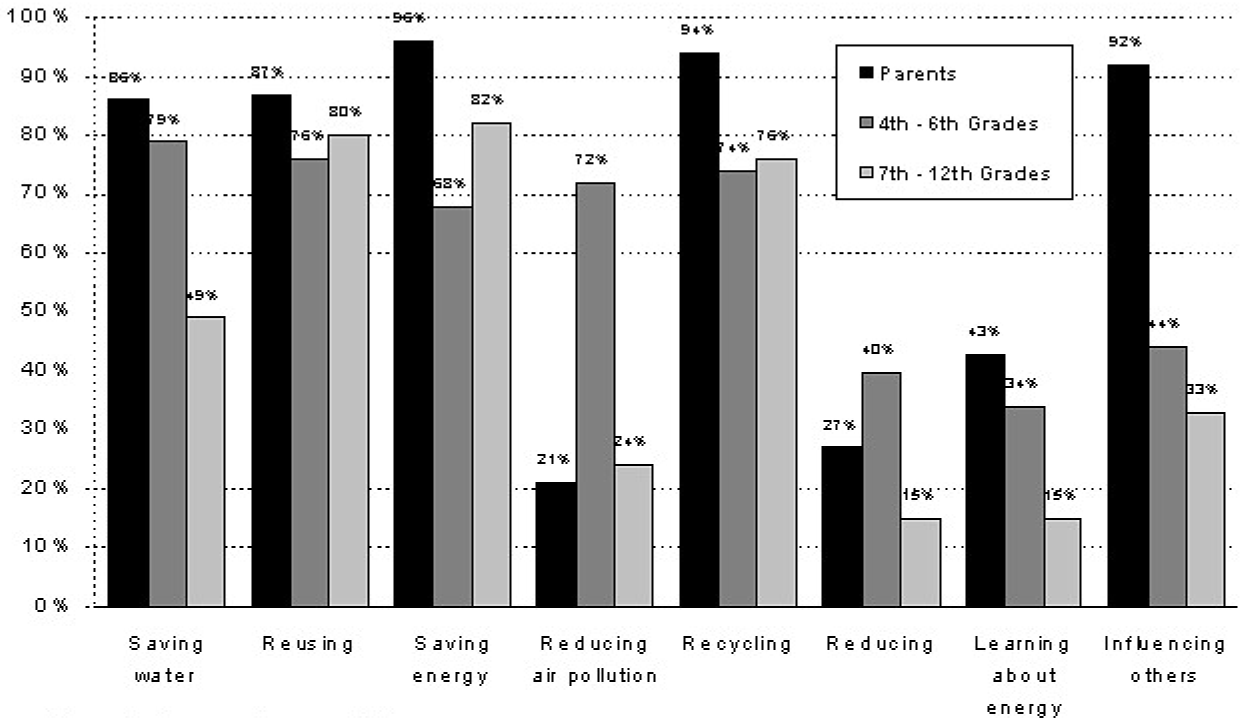
5.4.2 Actual Commitment to Energy Conservation

After assessing their willingness to consider the above energy conservation actions, parents and students were asked eight questions that assessed actual energy conservation commitments they were currently making (Figure 5-3).

Since parents generally feel they have more control and power over their actions that affect energy consumption than do students, it is not surprising that the parents have made more commitments towards energy conservation than their children. Not only are they more willing to take energy conservation measures, they are also more likely to be currently conserving energy in their everyday life.

- Parents are much more likely to influence others by talking their friends into recycling pop cans (92%) than are students (44% of 4^{th} – 6^{th} graders and 33% of 7^{th} – 12^{th} graders).
- The majority of parents and students save energy by turning off lights and appliances when not being used (96% of parents, 82% of older students, and 68% of younger students).
- Almost all parents (94%) say they recycle by separating things at home. This compares to 76% of 7^{th} – 12^{th} graders and 74% of 4^{th} – 6^{th} graders.
- Forty-three percent of parents learn about energy by reading newspaper and magazine articles about energy issues. Only 34% of 4^{th} – 6^{th} grade students and 15 percent of 7^{th} – 12^{th} grade students reported attempts to learn about energy.
- Similar to the set of willingness questions above, younger students are more likely than parents (72% versus 24% of 7^{th} – 12^{th} graders and 21% of parents) to walk places to do their part in helping solve air pollution problems.

Figure 5-3:
Actual Energy Conservation Commitments



*Percent saying very true or mostly true.

5.4.3 Attitudes Towards Energy Conservation Actions and Education

Ten statements were presented to students and parents to assess their attitudes toward energy conservation actions and education (Figure 5-4).

In general, parents have more positive attitudes towards conserving energy than do their children. Parents feel energy conservation is worth the effort, and they tend to be more concerned about all of these issues.

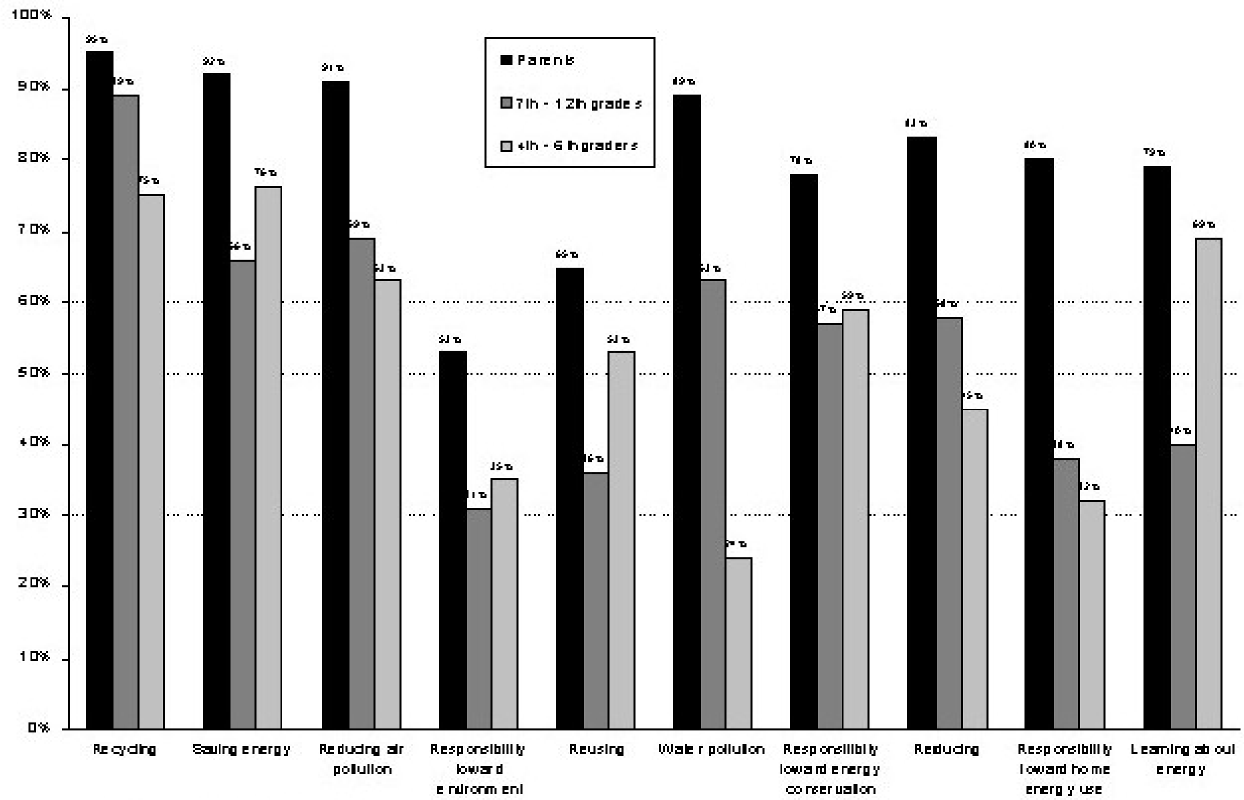
- Nearly all of the parents (95%) and students (89% of 7^{th} – 12^{th} graders and 75% of 4^{th} – 6^{th} graders) think recycling is worth the effort.
- The majority of the parents (91%) are concerned about the effects of pollution on their family; 69 percent of 7^{th} – 12^{th} grade students and 63 percent of 4^{th} – 6^{th} grade students are also concerned with this issue.
- A large percentage (89%) of parents are concerned about water pollution; 63 percent of 7^{th} – 12^{th} grade students share this concern. But only 24% of 4^{th} – 6^{th} grade students are concerned about this issue.

- Reducing waste is a common concern among parents (83%); 58% of 7th – 12th grade students and 45 percent of 4th – 6th grade students are equally concerned.

- Most of the parents (80%) feel the things they do affect energy usage in their home; only 38 percent of 7th – 12th grade students and 32 percent of 4th – 6th grade students share this perception.

- Many parents (79%) find it important to know about environmental problems and issues; over half of the students agreed (51%). Younger students are much more excited than older students about studying energy issues (69%).

Figure 5-4:
Attitudes Toward Energy Conservation



*Percent saying very true or mostly true.

The baseline survey measures indicate that a large majority of students say they are willing to take actions to recycle, save energy, save water, and reduce air pollution. Students' reported behaviors, however, indicate that a substantially smaller number are currently engaging in these activities. One reason for this is that students feel relatively low levels of responsibility for environmental actions or even for saving energy in their own homes. Only about one-third of the students feel that the things they do affect energy use in their home. Research on the relationship between attitudes and behaviors has shown that assuming a feeling of personal responsibility for energy use and its consequences is an important factor in motivating people to take actions to conserve energy and use resources wisely.

A lack of the knowledge and skills required to perform specific behaviors may also be an important reason why pro-environmental attitudes do not always lead to comparable actions to reduce energy use or environmental impacts. In order to increase the likelihood of energy conservation behaviors among students, energy education programs need to emphasize the personal responsibility of students and all individuals to do their part to benefit society. Energy education programs also need to provide instruction to teach students how to take specific actions appropriate to their age group to enable them to act on their commitment to saving energy, recycling, or reducing water use. If students feel personally responsible and have the specific skills required to take conservation actions, they will be more likely to engage in these behaviors.

CHAPTER 6
SUMMARY OF KEY FINDINGS AND CONCLUSIONS

6.1 WHO IS TEACHING ENERGY?

While a majority of Wisconsin teachers in the target population infuse the subject of energy into their classroom curriculum, there is still room for improvement. Even though most students learn about energy concepts and topics in at least one class, there is still a large proportion of teachers (47%) in the target population who do not currently teach their students about energy. The general characteristics of teachers in the target population who teach energy are summarized below.

- Energy teachers are more likely than non-energy teachers to be science or technical education teachers who teach in rural schools.
- Energy teachers tend to use a greater range of teaching materials including the Internet, videos, and novels.
- 67 percent of the classes where energy is taught are at the high school level.
- The majority of energy teachers (62% or more) teach each of the four KEEP energy themes, with Theme IV (Managing Energy Resource Use) being taught by the most teachers (69%).

Based on non-energy teacher responses, better access to resources and aids for teaching about energy and more in-service classes on energy education teaching methods are the two factors that would have the largest influence on non-energy teachers to include energy in their curriculum.

6.2 WHAT ARE STUDENTS LEARNING?

A large majority of students (74% or more) report having studied at least one of the four KEEP energy themes in school. Most students have learned about energy in a science class. When quizzed about their specific energy knowledge, students scored an average of 50 percent overall. The average score for students on each of the KEEP energy themes ranges between 45 – 62 percent, with the students scoring the highest on Theme IV: Managing Energy Resource Use (62%), and the lowest on Theme II: Developing Energy Resources (45%).

Although the baseline study was not designed to determine the causal relationship between students' energy knowledge and their energy behavior, the data were examined to assess the strength of the relationship between students' energy knowledge and their energy actions. Table 6-1 shows the relationship between students' energy scores and their willingness to conserve energy, their actual commitment to conserving energy, and their attitudes toward energy conservation and education.

Table 6-1:
Students' Energy Knowledge and Their Energy Actions

	Students with an overall energy score below 50% (n = 375)	Students with overall energy score between 50 – 69% (n = 336)	Students with overall energy score of 70% or higher (n = 110)
Overall Willingness to Conserve Energy[1]			
Willing to take energy actions[2]	34%	41%	55%
Neutral[3]	51%	49%	41%
Not willing to take energy actions[4]	15%	10%	4%
Total	100%	100%	100%
Actual Commitment to Conserve Energy[1]			
Committed to energy conservation[2]	31%	38%	51%
Neutral[3]	53%	49%	44%
Not committed to energy conservation[4]	16%	13%	5%
Total	100%	100%	100%
Overall Energy Attitudes[1]			
Positive towards energy conservation and education[2]	39%	50%	61%
Neutral[3]	54%	46%	36%
Negative towards energy conservation and education[4]	7%	4%	3%
Total	100%	100%	100%

[1] Overall energy willingness, commitment and attitudes was calculated by summing the individual 1 to 5 ratings (1 being "Very True" and 5 being "Very False") each respondent gave to a battery of questions in these three areas. An average score was then applied to each respondent indicating their overall rating.
[2] Respondents' whose overall rating was 1 – 2.4.
[3] Respondents' whose overall rating was 2.5 – 3.4.
[4] Respondents' whose overall rating was 3.5 – 5.

Students with a higher energy knowledge score are more likely to say they are willing to take energy conservation actions, report having taken an energy conservation action, and have more positive attitudes toward energy conservation and education. While the differences between students with high and low energy scores presented in this table *are statistically significant* (based on a 95% confidence interval), there may be other factors that contribute to this relationship that were outside the scope of the baseline study. One plausible hypothesis, however, is that increased energy knowledge may lead to an increase in positive attitudes and commitment to energy conservation behavior among students.

6.3 WHAT ROLE DO PARENTS HAVE?

When quizzed about their specific energy knowledge, parents achieved an average of 60 percent correct responses across all four KEEP energy themes. They scored at least 57 percent on each of the four energy themes and were most knowledgeable about Theme IV (Managing Energy Resource Use), scoring an average of 78 percent correct responses. Table 6-2 shows the relationship between parents' energy knowledge and their reported attitudes and commitment to energy conservation. The differences between the commitment and attitude measures between parents with overall energy knowledge scores below 50 percent and those with scores higher than 70 percent *are only marginally significant*. This can attributed in part to the smaller sample sizes for the parents survey and in part to the smaller differences between the groups of parents with lower and higher knowledge scores. Even though the relationship is not as strong as the one shown in Table 6-1 for students, the data show that willingness to conserve energy, commitment to energy conservation, and positive attitudes toward energy conservation and education all tend to be higher among parents with higher energy knowledge scores. This suggests that if KEEP is successful in producing an increase in energy knowledge among students' families, it may also lead to increased energy conservation actions and support for energy education programs in the state.

Table 6-2:
Parents' Energy Knowledge and Their Energy Actions

	Parents with overall energy score below 50% (n = 107)	Parents with overall energy score between 50 – 69% (n = 165)	Parents with overall energy score of 70% or higher (n = 156)
Overall Willingness to Conserve Energy[1]			
Willing to take energy actions[2]	65%	69%	72%
Neutral[3]	34%	29%	28%
Not willing to take energy actions[4]	2%	1%	1%
Total	100%	100%	100%
Actual Commitment to Conserve Energy[1]			
Committed to energy conservation[2]	63%	71%	74%
Neutral[3]	36%	26%	26%
Not committed to energy conservation[4]	1%	2%	0%
Total	100%	100%	100%
Overall Energy Attitudes[1]			
Positive towards energy conservation and education[2]	75%	77%	83%
Neutral[3]	24%	23%	17%
Negative towards energy conservation and education[4]	2%	0%	0%
Total	100%	100%	100%

[1] Overall energy willingness, commitment and attitudes was calculated by summing the individual 1 to 5 ratings each respondent gave to a battery of questions in these three areas. An average score was then applied to each respondent indicating their overall rating.
[2] Respondents' whose overall rating was 1 – 2.4.
[3] Respondents' whose overall rating was 2.5 – 3.4.
[4] Respondents' whose overall rating was 3.5 – 5.

6.3.1 The Relationship between Parents' Energy Knowledge and Their Child's Energy Knowledge and Behaviors

There may be a relationship between a parent's energy knowledge and the energy knowledge of their children (Table 6-3). Students whose parents' energy knowledge is high are more likely to have a higher energy knowledge score themselves. *This difference is statistically significant.*

Table 6-3:
Parent's Energy Knowledge and Their Child's Energy Knowledge[1]

	Parents with an overall energy score below 50% (n = 107)	**Parents with overall energy score between 50 – 69% (n = 165)**	**Parents with overall energy score of 70% or higher (n = 156)**
Child's Overall Energy Knowledge			
Below 50%	63%	47%	38%
Score between 50% and 69%	34%	46%	40%
Score of 70% or higher	4%	7%	22%
Total	100%	100%	100%

[1] Students whose parents did not complete a baseline survey were excluded from this analysis.

Parents' energy knowledge also appears to have some impact on students' willingness to conserve energy, their overall energy attitudes, and their child's actual commitment to conserving energy (Table 6-4). Children whose parents have a high overall energy knowledge score (70% or higher) are more likely to say they have actually performed energy conservation actions than children whose parents have lower energy knowledge scores. The differences in students' willingness to conserve energy and overall energy attitudes *are only marginally significant* for parents with lower and higher energy knowledge scores.

Table 6-4:
Parents' Energy Knowledge and Their Child's Willingness, Actual Commitment, and Attitudes

	Parents with an overall energy score below 50% (n = 107)	Parents with overall energy score between 50 – 69% (n = 165)	Parents with overall energy score of 70% or higher (n = 156)
Child's Overall Willingness to Conserve Energy[1]			
Willing to take energy actions[2]	39%	42%	49%
Neutral[3]	48%	51%	45%
Not willing to take energy actions[4]	13%	6%	6%
Total	100%	100%	100%
Child's Actual Commitment to Conserve Energy[1]			
Committed to energy conservation[2]	33%	42%	54%
Neutral[3]	48%	50%	39%
Not committed to energy conservation[4]	17%	7%	6%
Total	100%	100%	100%
Child's Overall Energy Attitudes[1]			
Positive towards energy conservation and education[2]	43%	54%	54%
Neutral[3]	53%	43%	39%
Negative towards energy conservation and education[4]	4%	3%	6%
Total	100%	100%	100%

[1] Overall energy willingness, commitment and attitudes was calculated by summing the individual 1 to 5 ratings each respondent gave to a battery of questions in these three areas. An average score was then applied to each respondent indicating their overall rating.
[2] Respondents' whose overall rating was 1 – 2.4.
[3] Respondents' whose overall rating was 2.5 – 3.4.
[4] Respondents' whose overall rating was 3.5 – 5.

6.3.2 Parental Support and Household Activities Can Be Used to Make Energy Education More Effective

Nearly all parents who completed a baseline survey indicate that they support energy education for their children. Parents also consistently report higher energy knowledge scores, more positive attitudes toward energy and resource conservation, and higher levels of actual conservation behaviors than students. Energy education programs can capitalize on this strong base of parental support and current household energy conservation activities to increase students' awareness and enthusiasm for energy topics and concepts. Energy education activities that increase student awareness of their parents' attitudes and the energy conservation activities that occur in their household will serve to strengthen their own commitment to energy conservation. Especially for younger students, awareness of their parents' support for energy conservation will make them more willing to talk to other students about energy topics and the need to conserve and use energy wisely. For older students, energy education activities that involve studying their own household behaviors may influence parents and other family members to explore other behaviors that reduce energy consumption or increase energy efficiency.

6.4 WHO IS INTERESTED IN AN ENERGY EDUCATION PROGRAM?

Almost all of the parents (99%) said they would find value in having certain activities at school that would teach their child about what energy is, how it is used, and ways in which energy use affects the environment. Seventy-four percent of students responded positively to these types of energy activities. In contrast to parents' and students' interest in energy activities, less than a third of the teachers (30%) were very interested in attending a training for an energy education program. The general characteristics of interested teachers are summarized below.

- Interested teachers are slightly more likely than uninterested teachers to teach in a rural setting (40% compared to 33%).
- Not surprisingly, science teachers (47%) are more interested in attending an energy education training than teachers of other subjects.
- Teachers who currently infuse energy in their classroom curriculum are more likely than those who do not to be interested in the training (78% compared to 42%).
- The majority of interested teachers use a variety of teaching materials such as videos (95%), magazine articles (77%), newspaper articles (71%), activity guides (68%), and the Internet.

6.5 WHAT CAN BE DONE TO HELP PROMOTE KEEP?

Based on the results of the baseline survey, several recommendations can be made to help KEEP reach the largest audience of people:

- Science teachers in rural areas are the best target for the KEEP program. They are the most interested in the program and already teach some energy related activities. Therefore, they will be the easiest teachers to reach in the short term.
- Non-science teachers are less likely to be interested in KEEP and currently do not include energy related activities in their curricula. One of the barriers to teaching energy is that these teachers feel energy is not appropriate for their subject matter. KEEP promotional materials need to appeal to a wide audience and convince non-science teachers that the KEEP energy activities can complement their current lesson plans.
- The two things that would have the largest influence on non-energy teachers including energy in their curricula would be better access to resources and aids for teaching about energy and more in-service classes on energy education teaching methods. KEEP does just that. Marketing efforts should be increased so more teachers are aware of the benefits of KEEP.
- The majority of parents and students support energy education. If school district administrators were aware of this, they might agree to schedule a KEEP in-service at one of their schools. This would allow a large number of teachers to have easy access to KEEP training.
- The data suggest that increased energy knowledge may increase the level of energy conservation behaviors among students. Groups that are interested in promoting energy conservation behavior may be interested in helping promote KEEP as well.
- The data also suggest that students with high knowledge scores tend to have parents with high knowledge scores. An ancillary program that included some adult education activities is a possible next step for KEEP to increase the overall effect of the program on Wisconsin students.

APPENDIX A
SAMPLE INFORMATION

LIST OF PARTICIPATING SCHOOL DISTRICTS

School District	Strata
Appleton	1
Eau Claire	1
Green Bay	1
Madison	1
Waukesha	1
Burlington	2
German town	2
Stevens Point	2
Sun Prairie	2
Denmark	3
Ellsworth	3
Holmen	3
Plymouth	3
Tomah	3
Bonduel	4
Markesan	4
North Fond du Lac	4
Pardeeville	4
Prairie du Chien	4

Prescott	4

Disposition of surveys by grade and strata.

Table 1: Number of Student/Parent Baseline Survey Completed by Strata and Grade

Grade	Strata 1 (5 Districts)		Strata 2 (4 Districts)		Strata 3 (5 Districts)		Strata 4 (6 Districts)		Total (20 Districts)	
	Student	Parent	Student	Parent	Student	Parent	Student	Parent	Student	Parent
4th	22	15	26	14	20	16	22	16	90	61
5th	27	11	21	14	20	15	43	38	111	78
6th	32	16	27	22	24	24	23	18	106	80
7th	26	14	26	15	25	16	25	10	102	55
8th	26	11	17	8	20	18	17	9	80	46
9th	21	12	20	2	30	13	17	1	88	28
10th	25	19	0	0	18	6	25	0	68	25
11th	23	6	28	16	21	13	26	3	98	38
12th	27	16	24	4	0	0	27	9	78	29
Total	229	120	189	95	178	121	225	104	821	440

Table 2: Demographics of Teachers Who Responded to the Survey Compared to the Total Target Population

	1997 Population of Teachers (n=14,741) (percent)	**Teachers who Completed Surveys (n=283)** (percent)
Strata		
1	21.8%	20.8%
2	24.3%	25.1%
3	26.9%	27.2%
4	27.0%	26.9%
Level of Degree		
Bachelor's Degree	59%	60%
Master's Degree	40%	40%
Years of Experience		
1 to 9 years	34.5%	36.7%
10 to 19 years	19.9%	18.4%
20 or more years	45.6%	45.0%
Cesa Number		
1	26.7%	24.7%
2,5,6,7	45.0%	46.6%
3,4,10	13.0%	15.5%
8,9,11,12	16.3%	13.1%
Subject Taught		
Elementary	14%	15%
Family/Consumer Ed	8%	8%
Technology Ed	14%	17%
Math	22%	22%
Science	17%	19%
Social Studies	23%	20%
Gender		
Female	40.9%	40.6%
Male	59.1%	59.4%

* The file used in sampling did not contain accurate grade level information for individual teachers, therefore that variable was not used in determining representiveness.

APPENDIX B
SURVEY INSTRUMENTS

Energy Education Survey for Wisconsin Teachers

ENERGY CENTER
OF WISCONSIN

Energy Education Survey for Parents of Wisconsin Students

**ENERGY CENTER
OF WISCONSIN**

YOUR TEACHING BACKGROUND AND EXPERIENCE

First, we'd like to determine the grade(s) and subject area(s) you are teaching this year, and ask some questions about the materials you plan to use in teaching.

1. How many years have you been a teacher, either at this school or some other school? *(Circle one number)*

   1 Less than 2 years
   2 2 - 5 years
   3 6 - 10 years
   4 11 - 20 years
   5 More than 20 years

2. Which of the following best describes your present school setting? *(Circle one number)*

   1 Urban
   2 Suburban
   3 Rural
   4 Other *(please specify: ____)*

3. What grade(s) are you teaching this school year? *(Circle all that apply)*

   K 1 2 3 4 5 6 7 8 9 10 11 12

4. How many different subjects (including electives that are only offered one semester) do you have to prepare for this school year? *(Fill in the blank)*

   ______ **subjects**

5. Please list the subject(s) you are teaching this school year. *(Fill in the blanks; If you are an Elementary teacher and teach a variety of subjects please write "Elementary")*

____

____

____

6. What is the total number of students you will teach this school year? *(Fill in the blank)*

_____students

7. Which of the following types of materials will you use for teaching this school year? *(Circle all that apply)*

1 Textbooks
2 Novels
3 Magazine articles
4 Newspaper articles
5 Videos
6 Computers
7 Internet
8 Community resources
9 Television programs
10 Field trips
11 Guest speakers
12 Curriculum guides
13 Activity guides
14 Other *(please specify: ____)*

TEACHING ENERGY

The next set of questions asks specifically about energy education. As we define it for this survey, energy education covers the following themes:

< *We Need Energy.* Defines energy, lists its sources and forms, and describes how energy is transferred and converted from one form to another according to the laws of thermodynamics, and explains how energy flows through living and nonliving systems.

< *Developing Energy Resources.* Addresses the sources of energy and how humans, through technology, use energy to meet societal wants and needs. It also shows how humans have come to treat energy as a resource.

< *Effects of Energy Resource Development.* Covers how using energy resources affect human societies and the environment.

< *Managing Energy Resource Use.* Identifies strategies to help resolve many of the issues related to energy resource developments. Also discusses how today's energy-related decisions and actions influence the future availability of energy resources.

8. Do you currently infuse energy education into your class curriculum? *(Circle one number)*

1 No
2 Yes-------->*SKIP TO QUESTION 11*

9. Why haven't you infused energy concepts into your classroom teaching? *(Circle all that apply)*

1 I do not have the knowledge or background to teach about energy
2 I do not have the class time
3 I do not have enough preparation time
4 I do not have enough resources or funding
5 Energy concepts are unrelated to my subject area
6 My school setting is not conducive to teaching about energy
7 Education about energy is not appropriate for the grade level I teach
8 I am not interested in teaching about energy
9 There are things other than energy that are more important to infuse in my teaching
10 Other: (please describe:_____________________________________)

10. Please indicate which ONE statement best represents the situation that would influence you the most to infuse energy concepts in to your classroom teaching. *(Circle one number)*

1 More support from my administration
2 More in-service classes on energy education teaching methods
3 Better access to resources and aids for teaching about energy
4 More preparation time
5 More funding
6 Other: (please describe:____)

IF YOU DON'T CURRENTLY TEACH ENERGY TO YOUR STUDENTS PLEASE SKIP TO QUESTION 18

11. Which of the themes of energy education (described in more detail on page 3) will you teach students this school year? *(Circle all that apply)*

- **1 We Need Energy**
- **2 Developing Energy Resources**
- **3 Effects of Energy Resource Development**
- **4 Managing Energy Resource Use**
- **5 Other** *(please describe: ____)*

12. What class(es) do you currently teach energy in? *(Please include both the grade and subject for each class in the blanks below)*

GRADE	SUBJECT
_______	___________________________________
_______	___________________________________
_______	___________________________________
_______	___________________________________

13. How does energy education fit into your curriculum? Do you teach it as . . . ? *(Circle one number)*

- **1 A separate unit**
- **2 One subject area within a larger unit**
- **3 Activities or exercises that fit into many units throughout the duration of the class**
- **4 Separate activities or exercises that are used in between units or as a break from the main unit**
- **5 Other** *(please describe: ____)*

14. Below are a number of statements about energy instruction. Please indicate how strongly you agree or disagree with each statement. *(Circle one number for each statement)*

Currently, my classroom teaching includes activities and lessons which	**Strongly Agree**	**Agree**	**Not Sure**	**Disagree**	**Strongly Disagree**
provide students with fundamental knowledge about energy.	**1**	**2**	**3**	**4**	**5**
promote student understanding of energy resources used in Wisconsin.	**1**	**2**	**3**	**4**	**5**
involve students in investigating the positive and negative effects of energy resource development and use.	**1**	**2**	**3**	**4**	**5**
help students gain skills that will allow them to manage their energy use effectively.	**1**	**2**	**3**	**4**	**5**

15. Which of the following materials do you use to teach ***energy***? *(Circle all that apply)*

- **1 Textbooks**
- **2 Novels**
- **3 Magazine articles**
- **4 Newspaper articles**
- **5 Videos**
- **6 Computers**
- **7 Internet**
- **8 Community resources**
- **9 Television programs**
- **10 Field trips**
- **11 Guest speakers**
- **12 Curriculum guides**
- **13 Activity guides**
- **14 Other** *(please specify: ____)*

16. (If you circled more than one type of material in Q15) Which of the above materials do you use as your primary material for teaching about energy? *(Please list one number)*

Number _____

17. What percentage of your instructional time is devoted to energy concepts? *(Circle one number)*

- **1 Less than 5%**
- **2 5% to 14%**
- **3 15% to 24%**
- **4 25% to 49%**
- **5 50% or more**

18. Below are some statements teachers have made about teaching energy in the classroom. Please indicate the degree to which you personally agree or disagree with each of these statements. *(Circle one number for each statement)*

At this time, I believe	**Strongly Agree**	**Agree**	**Not Sure**	**Disagree**	**Strongly Disagree**
energy education should be considered a priority in our K-12 education system.	**1**	**2**	**3**	**4**	**5**
energy education should be taught by select teachers, such as science teachers, rather than having the majority of teachers in a variety of subject areas teach it.	**1**	**2**	**3**	**4**	**5**
I have adequate training and experience to teach about energy.	**1**	**2**	**3**	**4**	**5**
Presently, I am comfortable with					
the number of published resources (e.g., teacher guides, videos, trade books) I can acquire to help me develop energy education lessons and activities.	**1**	**2**	**3**	**4**	**5**
using the Internet to gain access to energy education support materials.	**1**	**2**	**3**	**4**	**5**
contacting local and statewide community resources (e.g., professionals and agencies) to support my efforts to teach about energy.	**1**	**2**	**3**	**4**	**5**
my ability to integrate energy concepts into my curriculum.	**1**	**2**	**3**	**4**	**5**

AN ENERGY EDUCATION PROGRAM

For the next set of questions, please assume that you have been invited to participate in a program created to promote energy education in Wisconsin. Below, we have briefly described what a typical energy education program might look like. CEUs and tuition waiver would be available to certified, practicing K-12 teachers in Wisconsin school districts who participate in the program.

Mission: To initiate and facilitate the development, dissemination, implementation, and evaluation of energy education programs within Wisconsin Schools.

How: Through hands-on activities and class discussions, this program would assist teachers in enhancing students' understanding of what energy is, where it comes from, and how it affects their lives. Teachers would receive a copy of a comprehensive, easy-to-use activity guide as well as other energy-related materials.

Concepts: The activity guide and other energy-related materials would be organized around the following four themes:

< *We Need Energy.* Defines energy, lists its sources and forms, and describes how energy is transferred and converted from one form to another according to the laws of thermodynamics, and explains how energy flows through living and nonliving systems.

< *Developing Energy Resources.* Addresses the sources of energy and how humans, through technology, use energy to meet societal wants and needs. It also shows how humans have come to treat energy as a resource.

< *Effects of Energy Resource Development.* Covers how using energy resources affect human societies and the environment.

< *Managing Energy Resource Use.* Identifies strategies to help resolve many of the issues related to energy resource developments. Also discusses how today's energy-related decisions and actions influence the future availability of energy resources.

19. In your opinion, what would be some of the advantages or benefits, if any, of having this type of Energy Education Program available to students and teachers? *(Fill in the blanks; if none, write none)*

____

____

____

20. What would be some of the disadvantages, if any, of having this type of Energy Education Program available to students and teachers? *(Fill in the blanks; if none, write none)*

____

____

____

21. On a scale of 1 to 10 with 1 being "Not At All Interested" and 10 being "Extremely Interested," how interested would you be in attending a training for this type of Energy Education Program? *(Circle one number)*

Not At All Interested									Extremely Interested
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

22. Why do you feel that way? *(Fill in the blanks)*

____

23. Assuming you were to attend the Energy Education program training sometime this month, how soon would you incorporate the energy activities and materials into your classroom teaching? *(Circle one number)*

1 Immediately
2 Not right away, but sometime this semester
3 Not until next semester
4 Not until next school year
5 I wouldn't incorporate them this year or next

24. The following items are goals that teachers may want to achieve by incorporating an Energy Education Program into their classroom teaching. On a scale of 1 to 10, with 1 being "Not at all Important" and 10 being "Very Important" please indicate how important it would be to you that students learn each of the following items from this type of Energy Education Program. *(Circle one number for each item)*

How important is it that students learn. . .?

	Not At All Important									Very Important
what energy is and where it comes from.	1	2	3	4	5	6	7	8	9	10
the natural laws that govern energy.	1	2	3	4	5	6	7	8	9	10
how living systems use energy.	1	2	3	4	5	6	7	8	9	10
that the world around them depends on a continuous supply of energy.	1	2	3	4	5	6	7	8	9	10
how humans have used technology to further their ability to use energy.	1	2	3	4	5	6	7	8	9	10
how supply and demand influence energy resource development and use.	1	2	3	4	5	6	7	8	9	10

How important is it that students learn. . .?

	Not At All Important									Very Important
how energy use affects the quality of human life.	1	2	3	4	5	6	7	8	9	10
how current energy use practices affect the quality of the environment and the health of organisms living in the environment.	1	2	3	4	5	6	7	8	9	10
to identify actions they can take to better manage energy resources.	1	2	3	4	5	6	7	8	9	10
how scientific, technological and social changes will influence future energy resource availability.	1	2	3	4	5	6	7	8	9	10
to discuss energy resource use and management with family members.	1	2	3	4	5	6	7	8	9	10

Thank you for your help with this study. Please feel free to write any additional comments in the space below.

Please return this survey in the envelope provided to:

Energy Center of Wisconsin Teacher Survey
c/o Hagler Bailly Research
University Research Park
455 Science Drive
Madison, WI 53711-1058

Energy Education Survey for Parents of Wisconsin Students

ENERGY CENTER OF WISCONSIN

What Do You Know About Energy?

First, we'd like you to answer some questions about energy. This information will help us understand what parents know about energy use. If you really don't know the answer to a question, circle "don't know" rather than guess at the correct answer.

1. What is the Earth's primary source of energy? *(Circle one number)*

   1 Coal
   2 Oil
   3 Sun
   4 Natural gas
   5 Don't know

2. Which of the following energy resources is NOT a renewable energy resource? *(Circle one number)*

   1 Solar energy
   2 Wind energy
   3 Natural gas
   4 Don't know

3. When a light bulb is turned on, some of its energy is used to emit light. The rest of its energy is. . . ? *(Circle one number)*

   1 stored for future use
   2 lost in waste heat
   3 stays in the light bulb and cannot be used
   4 don't know

4. It is impossible to . . . ? *(Circle one number)*

   1 convert chemical energy to heat energy
   2 measure the amount of heat energy in foods
   3 build a machine that produces more energy than it uses
   4 none of the above
   5 don't know

5. A rabbit eats some corn. The energy from the corn goes into the rabbit. The next day a fox eats the rabbit. The fox gets very little of the energy that was in the corn. Why? *(Circle one number)*

   1 A fox can't digest corn
   2 The rabbit has already digested the corn
   3 Corn doesn't have much energy
   4 Most of the corn's energy was used by the rabbit
   5 Don't know

6. Each of the following food chains start with the same amount of green plants. Assuming that the green plants are digestible by humans, which of the food chains would supply the most energy to humans? *(Circle one number)*

   1 Green plants to humans
   2 Green plants to cattle to humans
   3 Green plants to insects to fish to humans
   4 Green plants to insects to small fish to larger fish to humans
   5 Don't know

7. Any high-speed transmission of energy in the form of particles or electromagnetic waves is called . . . ? *(Circle one number)*

   1 convection
   2 radiation
   3 conduction
   4 decomposition
   5 don't know

8. The main source(s) of emissions that have been identified as contributing to acid deposition (acid rain) in the United States are . . . ? *(Circle one number)*

   1 volcanoes and forest fires
   2 petroleum refineries
   3 automobiles and coal burning plants
   4 aerosol sprays and refrigerant leakage
   5 don't know

9. Burning coal for energy . . . ? *(Circle one number)*

   1 releases carbon dioxide and other pollution into the air
   2 decreases needed acid rain
   3 reduces the amount of ozone in the stratosphere
   4 is too expensive
   5 pollutes the water in acquifers
   6 don't know

10. Acid rain is a problem because . . . ? *(Circle one number)*

   1 it may harm plants by affecting their leaves and changing the soil they grow in
   2 it may break down the layer of ozone in the Earth's atmosphere
   3 people may have to stay indoors when it's raining
   4 it may cause a slow change in the Earth's temperature
   5 don't know

11. The energy currently present . . . ? *(Circle one number)*

    1 is all the energy we will ever have
    2 can change form but is never destroyed
    3 can only be used once
    4 is mostly in the form of fossil fuel energy
    5 don't know

12. Which of the following is considered to be a non-renewable energy source (meaning it cannot be replenished)? *(Circle one number)*

    1 Oil
    2 Wood
    3 Biomass
    4 None of the above
    5 Don't know

13. One suggested advantage of using nuclear power plants instead of coal or oil for energy production is . . . ? *(Circle one number)*

    1 nuclear power plants are not expensive to build
    2 the waste products are easy to store
    3 they are totally safe
    4 there is less air pollution
    5 don't know

14. The energy in the food we eat initially came from . . .? *(Circle one number)*

    1 water
    2 the sun
    3 oxygen
    4 none of the above
    5 don't know

15. Humans use energy from coal and oil by burning them. Another source of energy for humans is . . . ? *(Circle one number)*

    1 cold water
    2 a well insulated home
    3 a furnace
    4 the sun
    5 don't know

16. Which type of energy will be available for human use for the longest period of time? *(Circle one number)*

1 Oil
2 Coal
3 Solar Energy
4 Don’t know

17. The most prevalent criteria pollutant (index of pollution levels) in Wisconsin is . . . ? *(Circle one number)*

1 Carbon monoxide
2 Lead
3 Sulfur dioxide
4 Ozone
5 Don’t know

18. Which energy source do scientists think will be in short supply in the next several hundred years? *(Circle one number)*

1 The wind
2 Oil
3 Water flowing over a dam
4 The sun
5 Don’t know

19. Which of the following offers the most potential for reducing our immediate energy problems? *(Circle one number)*

1 Geothermal power
2 Energy conservation
3 Biomass conversion
4 Tidal power
5 Don’t know

20. Which form of energy is involved in writing? *(Circle one number)*

1 Mechanical energy
2 Kinetic energy
3 Potential energy
4 Both 1 and 2
5 Don’t know

21. The process of photosynthesis in green plants . . . ? *(Circle one number)*

1 **uses sunlight to burn energy in plants**
2 **changes light energy into chemical energy**
3 **changes chlorophyll into sugar**
4 **is a process used to burn sugar stored in plants so the plants can grow**
5 **don't know**

22. Electric current is the flow of . . . ? *(Circle one number)*

1 **energy**
2 **electrons**
3 **protons**
4 **atoms**
5 **don't know**

23. Most municipal sold waste in the United States is presently disposed of by what method? *(Circle one number)*

1 **Burning it in closed incinerators**
2 **Recycling**
3 **Shipping it out to sea and dumping it**
4 **Burying it in landfills**
5 **Don't know**

24. What is the primary renewable resource used in Wisconsin? *(Circle one number)*

1 **Wood**
2 **Hydroelectric power**
3 **Petroleum**
4 **Solar power**
5 **Don't know**

Things that Use Energy in Your Home

Now we would like to know about things in your home that use energy. Once again, please read the questions carefully and circle the answer that you think is right. If you don't know the answer to a question, please circle "don't know" rather than guess at the correct answer.

25. What type of fuel does the main heating system in your home use? *(Circle one number)*

1 Natural gas
2 Electricity
3 LP Fuel/Oil
4 Wood
5 Other *(Please describe: ______________________________________)*
6 Don't know

26. Which one of the following items found in many homes uses the most electricity? *(Circle one number)*

1 Lights
2 TV
3 Electric hot water heater
4 Telephone
5 Refrigerator
6 Don't know

27. How often do you talk with your children about saving energy around the house (for example, shutting off lights when they are not being used, turning down the heat, closing doors and windows)? *(Circle one number)*

1 Never or rarely
2 Occasionally – about twice a year
3 Frequently – about once a month
4 All the time – once a week or more

28. How often do you talk with your children about energy expenses such as the size of the bill for electricity or home heating, or the cost of gasoline for the car? *(Circle one number)*

1 Never or rarely
2 Occasionally – about twice a year
3 Frequently – about once a month
4 All the time – once a week or more

WHAT ARE YOU WILLING TO DO?

Below are several sentences below that describe things you might or might not want to do. Please read each sentence and decide if you think that sentence is very true, mostly true, mostly false or very false. If you're not sure, you can circle "not sure". There are no right or wrong answers, we just want to know what you think you would be willing to do.

29. Here are some statements about some things you might or might not want to do. Please read each one and decide if it is Very True, Mostly True, Mostly False or Very False and circle the correct number. If you're not sure a statement is true or not for you, circle the 3 for Not Sure. *(Circle one number for each statement)*

	Very True	Mostly True	Not Sure	Mostly False	Very False
To save water, I am willing to turn off the water when I brush my teeth.	1	2	3	4	5
I am willing to purchase one product instead of another because it is packaged in reusable, returnable, or recyclable containers or packages.	1	2	3	4	5
To save energy, I am willing to watch one hour less of TV per day.	1	2	3	4	5
To reduce air pollution, I am willing to walk, ride my bike, take the bus, or carpool instead of using a car.	1	2	3	4	5
I am willing to throw plastic and glass in a separate recycling trash can.	1	2	3	4	5
I would rather use paper plates than wash dishes (by hand).	1	2	3	4	5
I do not want my children spending more time learning about energy.	1	2	3	4	5
I would feel uncomfortable asking someone not to litter.	1	2	3	4	5

30. Here are some more statements that you can rate as true or false for you. These statements talk about things you may or may not have actually done. Please read each statement and decide if it is Very True, Mostly True, Mostly False or Very False and circle the correct number. If you're not sure a statement is true or not for you, circle the 3 for Not Sure. *(Circle one number for each statement)*

	Very True	Mostly True	Not Sure	Mostly False	Very False
I usually do not read newspaper and magazine articles about energy issues.	1	2	3	4	5
I try to save water.	1	2	3	4	5
To save electricity, I turn off lights and appliances when they are not being used.	1	2	3	4	5
I usually throw my old clothes in the garbage instead of trying to give them to someone else who could use them.	1	2	3	4	5
I tell my children to recycle pop cans instead of throwing them in the trash.	1	2	3	4	5
I have walked more places in order to do my part in helping solve pollution problems.	1	2	3	4	5
I buy things that I want regardless of how they are packaged.	1	2	3	4	5
I separate things at home for recycling.	1	2	3	4	5

31. Here is the final list of statements. Once again, you have to decide if they are true or false for you. This time the statements are about the way you feel. Please read each one and decide if it is Very True, Mostly True, Mostly False or Very False for you and circle the correct number. If you're not sure a statement is true or not, circle the 3 for Not Sure. *(Circle one number for each statement)*

	Very True	**Mostly True**	**Not Sure**	**Mostly False**	**Very False**
I think recycling is worth the effort.	**1**	**2**	**3**	**4**	**5**
It makes me happy to see people trying to save energy.	**1**	**2**	**3**	**4**	**5**
I am not concerned about the effects of pollution on my family.	**1**	**2**	**3**	**4**	**5**
When I have done something that harms the environment I feel there is very little I can do to make it right.	**1**	**2**	**3**	**4**	**5**
I get upset when I think of things people throw away that could be reused.	**1**	**2**	**3**	**4**	**5**
I am concerned about environmental health hazards such as those caused by air or water pollution.	**1**	**2**	**3**	**4**	**5**
Energy problems will only be solved when people like me change the way we live.	**1**	**2**	**3**	**4**	**5**
I am concerned about how much waste is produced in this country.	**1**	**2**	**3**	**4**	**5**
Things my children do don't have much much effect on the energy use in my home.	**1**	**2**	**3**	**4**	**5**
Knowing about environmental problems and issues is important to me.	**1**	**2**	**3**	**4**	**5**

ENERGY ACTIVITIES AT SCHOOL

Please imagine that your child told you he/she was going to learn about energy in school next week. His or her teacher would assign activities that would help your child learn more about what energy is, how it is used, and ways in which energy use affects the environment.

32. How would you feel about your child having these types of energy activities in class? *(Circle one number)*

    1 I would think it was very valuable
    2 I would think it was somewhat valuable
    3 I would think it was not at all valuable

33. Below are a list of energy topics your child might study in class. On a scale of 1 to 5 with 1 being "Not at all important" and 5 being "Very important" please tell us how important you feel it is that your child study each topic. *(Circle one number for each energy topic)*

	Not at all Important				Very Important
How much energy is stored in foods	1	2	3	4	5
How the sun's energy travels through organisms	1	2	3	4	5
Why energy can neither be created or destroyed	1	2	3	4	5
How some energy becomes unavailable with each energy conversion	1	2	3	4	5
The advantages and disadvantages of nuclear energy	1	2	3	4	5
How motors and generators are used to meet energy needs	1	2	3	4	5
How energy prices are determined	1	2	3	4	5
What can be done to address air pollution	1	2	3	4	5
The kinds of energy used at earlier times in history	1	2	3	4	5
How energy use affects the environment	1	2	3	4	5
How solar or wind energy could be used in your home	1	2	3	4	5
Career opportunities associated with energy development and use	1	2	3	4	5

(OVER)

34. What is the highest level of education you have completed? *(Circle one number)*

1 **Less than high school**
2 **Some high school**
3 **High School graduate or GED**
4 **Some college or technical school**
5 **College or technical school graduate**
5 **Post graduate work**

35. What is your zip code? *(Fill in the blank)*

____

36. Finally, are you . . . ? *(Circle one number)*

1 **Female**
2 **Male**

Thank you for your time.

If you have any additional comments, please write them in the space below.

Energy Education Survey for Wisconsin Students

ENERGY CENTER OF WISCONSIN

4^{th} – 6^{th} Grade Versions

What Do You Know About Energy?

First, we'd like you to answer some questions about energy. This information will help us understand what you and other students know about energy and what you don't know. So please do your best on each question, but if you really don't know the answer, circle "don't know".

1. What is the Earth's primary source of energy? *(Circle one number)*

   1 Coal
   2 Oil
   3 Sun
   4 Natural gas
   5 Don't know

2. Which of the following energy resources is NOT a renewable energy resource? *(Circle one number)*

   1 Solar energy
   2 Wind energy
   3 Natural gas
   4 Don't know

3. Each and every action on Earth involves . . . ? *(Circle one number)*

   1 food
   2 energy
   3 water
   4 sun
   5 don't know

4. An animal that can get its energy from either producers or consumers is called a . . . ? *(Circle one number)*

   1 herbivore
   2 omnivore
   3 carnivore
   4 don't know

5. A rabbit eats some corn. The energy from the corn goes into the rabbit. The next day a fox eats the rabbit. The fox gets very little of the energy that was in the corn. Why? *(Circle one number)*

   1 A fox can't digest corn
   2 The rabbit has already digested the corn
   3 Corn doesn't have much energy
   4 Most of the corn's energy was used by the rabbit
   5 Don't know

6. Which of the following would give humans the most food energy from 1,000 pounds of plants? Assume the plants are good for people to eat. *(Circle one number)*

 1 **Feed the plants to insects, feed the insects to fish, then humans eat the fish**
 2 **Humans eat the plants**
 3 **Feed the plants to cattle then humans eat the cattle**
 4 **Feed the plants to fish then humans eat the fish**
 5 **Don't know**

7. Thermal energy transferred by contact from a warm object to a cooler object is called . . . ? *(Circle one number)*

 1 **convection**
 2 **radiation**
 3 **conduction**
 4 **decomposition**
 5 **don't know**

8. Many people believe the Earth's average temperature is changing. They say that one important cause of this change is . . . ? *(Circle one number)*

 1 **using fuels like gasoline that burn and release carbon dioxide**
 2 **the sun is moving closer to the Earth**
 3 **acid rain**
 4 **rising ocean levels**
 5 **don't know**

9. Burning coal for energy . . . ? *(Circle one number)*

 1 **releases carbon dioxide and other pollution into the air**
 2 **decreases needed acid rain**
 3 **reduces the amount of ozone in the stratosphere**
 4 **is too expensive**
 5 **pollutes the water in acquifers**
 6 **don't know**

10. Acid rain is a problem because . . . ? *(Circle one number)*

 1 **it may harm plants by affecting their leaves and changing the soil they grow in**
 2 **it may break down the layer of ozone in the Earth's atmosphere**
 3 **people may have to stay indoors when it's raining**
 4 **it may cause a slow change in the Earth's temperature**
 5 **don't know**

11. Coal and petroleum are examples of . . . ? *(Circle one number)*

1 fossil fuels
2 renewable sources of energy
3 energy sources that are plentiful
4 alternative sources of energy
5 recycled resources
6 don't know

12. An example of an energy resource that cannot be replenished is . . . ? *(Circle one number)*

1 petroleum
2 trees
3 ocean water
4 animals raised for food
5 don't know

13. One suggested advantage of using nuclear power plants instead of coal or oil for energy production is . . . ? *(Circle one number)*

1 nuclear power plants are not expensive to build
2 the waste products are easy to store
3 they are totally safe
4 there is less air pollution
5 don't know

14. Wood was the main energy resource used in Wisconsin to heat homes in the 1700's. When Wisconsin became an industrial society in the mid-1850's, which of the following became the primary energy source for heating homes? *(Circle one number)*

1 natural gas
2 oil
3 coal
4 propane
5 don't know

15. Humans use energy from coal and oil by burning them. Another source of energy for humans is . . . ? *(Circle one number)*

1 cold water
2 a well insulated home
3 a furnace
4 the sun
5 don't know

16. Which type of energy will be available for human use for the longest period of time? *(Circle one number)*

1 Oil
2 Coal
3 Solar energy
4 Don't know

17. Lights, many kitchen appliances, televisions and computers all require electricity to work. The energy needed to produce electricity comes from . . . ? *(Circle one number)*

1 burning fossil fuels or nuclear resources
2 dams on rivers
3 windmills
4 all of the above
5 don't know

18. Which energy source will be in short supply in the next several hundred years? *(Circle one number)*

1 The wind
2 Oil
3 Water flowing over a dam
4 The sun
5 Don't know

19. Fewer resources are wasted when shoppers buy things that . . . ? *(Circle one number)*

1 are in containers that can be used again
2 have a label saying they are made from natural products
3 are wrapped separately so they stay clean and new looking
4 are disposable
5 don't know

20. Which form of energy is involved in writing? *(Circle one number)*

1 Mechanical energy
2 Kinetic energy
3 Potential energy
4 Both 1 and 2
5 Don't know

21. How do you know that a piece of wood has stored potential energy? *(Circle one number)*

1 It can be converted into other things such as paper and furniture
2 It was once a living thing
3 It releases heat when burned
4 It is a stationary object
5 Don't know

22. Electric current is the flow of . . . ? *(Circle one number)*

1 energy
2 electrons
3 protons
4 atoms
5 don't know

23. Which of the following will help make the amount of garbage going into landfills smaller? *(Circle one number)*

1 Reusing things before we throw them away
2 Reducing the amount of things we use
3 Recycling as much as possible
4 All of the above
5 Don't know

24. What is the primary renewable resource used in Wisconsin? *(Circle one number)*

1 Wood
2 Hydroelectric power
3 Petroleum
4 Solar power
5 Don't know

Things that Use Energy in Your Home

Now we would like to know about things you use everyday in your home that use energy. Once again, please read the questions carefully and circle the answer that you think is right. If you don't know an answer, please circle "don't know".

25. What type of fuel does the main heating system in your home use? *(Circle one number)*

1 Natural gas
2 Electricity
3 LP fuel/oil
4 Wood
5 Other *(Please describe: ____)*
6 Don't know

26. Which of the following items found in many homes uses the most electricity? *(Circle one number)*

1 Lights
2 TV
3 Electric hot water heater
4 Telephone
5 Refrigerator
6 Don't know

27. How often does your family talk about saving energy around the house (for example, shutting off lights when they are not being used, turning down the heat, closing doors and windows)? *(Circle one number)*

1 Never or rarely
2 Occasionally – about twice a year
3 Frequently – about once a month
4 All the time – once a week or more

28. How often does your family talk about energy expenses such as the size of the bill for electricity or home heating, or the cost of gasoline for the car? *(Circle one number)*

1 Never or rarely
2 Occasionally – about twice a year
3 Frequently – about once a month
4 All the time – once a week or more

WHAT ARE YOU WILLING TO DO?

In the next questions we want to know which things you might or might not want to do. There are several sentences below that describe things you might be willing or not willing to do. Please read each sentence and decide if you think that sentence is very true, mostly true, mostly false or very false. If you're not sure, you can circle "not sure". There are no right or wrong answers, we just want to know what you would be willing to do.

29. Here are some statements about some things you might or might not want to do. Please read each one and decide if it is Very True, Mostly True, Mostly False or Very False and circle the correct number. If you're not sure if a statement is true or not for you, circle the 3 for Not Sure. *(Circle one number for each statement)*

	Very True	Mostly True	Not Sure	Mostly False	Very False
To save water, I am willing to turn off the water when I brush my teeth.	1	2	3	4	5
I would rather throw something away instead of trying to fix it.	1	2	3	4	5
To save energy, I am willing to watch one hour less of TV per day.	1	2	3	4	5
To reduce air pollution, I am willing to ride the bus, ride my bike, or walk to more places instead of getting a ride in a car.	1	2	3	4	5
I am willing to throw plastic and glass in a separate recycling trash can.	1	2	3	4	5
I would rather use paper plates than wash dishes (by hand).	1	2	3	4	5
I do <u>not</u> want to spend more time learning about energy.	1	2	3	4	5
I would feel uncomfortable asking someone not to litter.	1	2	3	4	5

30. Here are some more statements that you can rate as true or false for you. These statements talk about things you may or may not have actually done. Please read each statement and decide if it is Very True, Mostly True, Mostly False or Very False and circle the correct number. If you're not sure a statement is true or not for you, circle the 3 for Not Sure. *(Circle one number for each statement)*

	Very True	**Mostly True**	**Not Sure**	**Mostly False**	**Very False**
I never ask my parents how to save energy in our home.	**1**	**2**	**3**	**4**	**5**
I try to save water.	**1**	**2**	**3**	**4**	**5**
To save energy, I turn off lights at home without being asked.	**1**	**2**	**3**	**4**	**5**
I usually throw my old clothes and toys in the garbage instead of trying to give them to someone else who could use them.	**1**	**2**	**3**	**4**	**5**
I remind my family to turn off lights to save energy.	**1**	**2**	**3**	**4**	**5**
I walk to places that are nearby instead of asking for a ride.	**1**	**2**	**3**	**4**	**5**
I use paper plates whenever I can so I don't have to do as many dishes.	**1**	**2**	**3**	**4**	**5**
I separate cans and bottles for recycling.	**1**	**2**	**3**	**4**	**5**

31. Here is the last list of statements. Once again you have to decide if they are true or false. This time the statements are about the way you feel. Please read each one and decide if it is Very True, Mostly True, Mostly False or Very False for you and circle the correct number. If you're not sure a statement is true or not, circle the 3 for Not Sure. *(Circle one number for each statement)*

	Very True	**Mostly True**	**Not Sure**	**Mostly False**	**Very False**
It makes me happy when people recycle used bottles, cans, and paper.	**1**	**2**	**3**	**4**	**5**
It makes me happy to see people trying to save energy.	**1**	**2**	**3**	**4**	**5**
I am not concerned about the effects of pollution on my family.	**1**	**2**	**3**	**4**	**5**
When I have done something that harms the environment I feel there is very little I can do to make it right.	**1**	**2**	**3**	**4**	**5**
I get upset when I think of things people throw away that could be reused.	**1**	**2**	**3**	**4**	**5**
I am not concerned if a little water gets polluted because there is plenty of water.	**1**	**2**	**3**	**4**	**5**
Energy problems will only be solved when people like me change the way we live.	**1**	**2**	**3**	**4**	**5**
It bothers me that I throw so many things in the garbage.	**1**	**2**	**3**	**4**	**5**
Things I do don't have much effect on the energy use in my home.	**1**	**2**	**3**	**4**	**5**
It makes me happy to learn new ways to save energy.	**1**	**2**	**3**	**4**	**5**

LEARNING ABOUT ENERGY

The next set of questions asks about where you get information on energy issues, what you learn about energy in school and if you're interested in learning more about energy. In some questions, you may want to circle more than one answer. If the instructions next to the question say "Circle all that apply" then that's okay. Remember, there are no right or wrong answers, we just want to know what you think.

32. The next items describe energy topics that you may or may not have studied in school. Please circle Yes or No to indicate if you studied each topic. *(Circle one answer for each topic)*

Topic	Have you studied this?	
What energy is and where it comes from	**Yes**	**No**
Identifying forms of potential and kinetic energy	**Yes**	**No**
How energy is transferred between organisms in a food chain	**Yes**	**No**
The contribution of sun, wind, and water to the energy cycle	**Yes**	**No**
What products and materials are made from fossil fuels	**Yes**	**No**
How electric circuits work	**Yes**	**No**
How much it costs each year to run refrigerators and other household appliances	**Yes**	**No**
The pros and cons of using public transportation versus private travel	**Yes**	**No**
How to safely use electricity around the home	**Yes**	**No**
How energy use affects the environment	**Yes**	**No**
How to save energy in your home	**Yes**	**No**
How business and industry can save energy	**Yes**	**No**

33. In what class or classes did you learn about these things? *(Circle all that apply)*

0 I haven't learned any of those things in school
1 Science
2 Social Studies
3 Math
4 Other *(Please describe: ____)*
5 Don't remember

34. Please circle all the ways you have learned about energy issues at school. *(Circle all that apply)*

1 **Teachers**
2 **Textbooks**
3 **TV programs or videos**
4 **Computer/Internet**
5 **Field trips**
6 **Other** *(Please describe: ____)*
7 **Don't remember**

35. Please circle all the ways you have learned about energy issues at home. *(Circle all that apply)*

1 **Family members**
2 **TV programs or videos**
3 **Magazines/newspaper articles**
4 **Computer/Internet**
5 **Family vacations/trips**
6 **Other** *(Please describe: ____)*
7 **Don't remember**

ENERGY ACTIVITIES AT SCHOOL

Please imagine that your teacher told you that next week you were going to learn about energy. Your teacher would give you activities to do that would help you learn more about what energy is, how it is used, and ways in which energy use affects the environment.

36. How would you feel about having these types of energy activities in class? *(Circle one number)*

1 **I would be excited**
2 **I would think it was okay**
3 **I would think it sounded boring**
4 **I would hate it**

(OVER)

37. Below are a list of energy topics you could study in class. On a scale of 1 to 5 with 1 being “Not at all Interested” and 5 being “Very Interested” please tell us how interested you would be in studying each topic. *(Circle one number for each energy topic)*

	Not at all Interested				**Very Interested**
What energy is and where it comes from	**1**	**2**	**3**	**4**	**5**
Identifying forms of potential and kinetic energy	**1**	**2**	**3**	**4**	**5**
How energy is transferred between organisms in a food chain	**1**	**2**	**3**	**4**	**5**
The contribution of sun, wind and water to the energy cycle	**1**	**2**	**3**	**4**	**5**
What products and materials are made from fossil fuels	**1**	**2**	**3**	**4**	**5**
How electric circuits work	**1**	**2**	**3**	**4**	**5**
How much it costs each year to run refrigerators and household appliances	**1**	**2**	**3**	**4**	**5**
The pros and cons of public transportation versus private travel	**1**	**2**	**3**	**4**	**5**
How to safely use electricity around the home	**1**	**2**	**3**	**4**	**5**
How energy use affects the environment	**1**	**2**	**3**	**4**	**5**
How to save energy in your home	**1**	**2**	**3**	**4**	**5**
How business and industry can save energy	**1**	**2**	**3**	**4**	**5**

38. Are you . . .? *(Circle one number)*

1 Female
2 Male

Thank you for your time!

Energy Education Survey for Wisconsin Students

ENERGY CENTER
OF WISCONSIN

What Do You Know About Energy?

First, we'd like you to answer some questions about energy. This information will help us understand what you and other students know about energy and what you don't know. So please do your best on each question, but if you really don't know the answer, circle "don't know".

1. What is the Earth's primary source of energy? *(Circle one number)*

   1 Coal
   2 Oil
   3 Sun
   4 Natural gas
   5 Don't know

2. Which of the following energy resources is NOT a renewable energy resource? *(Circle one number)*

   1 Solar energy
   2 Wind energy
   3 Natural gas
   4 Don't know

3. When a light bulb is turned on, some of its energy is used to emit light. The rest of its energy is. . . ? *(Circle one number)*

   1 stored for future use
   2 lost in waste heat
   3 stays in the light bulb and cannot be used
   4 don't know

4. It is impossible to . . . ? *(Circle one number)*

   1 convert chemical energy to heat energy
   2 measure the amount of heat energy in foods
   3 build a machine that produces more energy than it uses
   4 none of the above
   5 don't know

5. A rabbit eats some corn. The energy from the corn goes into the rabbit. The next day a fox eats the rabbit. The fox gets very little of the energy that was in the corn. Why? *(Circle one number)*

   1 A fox can't digest corn
   2 The rabbit has already digested the corn
   3 Corn doesn't have much energy
   4 Most of the corn's energy was used by the rabbit
   5 Don't know

6. Each of the following food chains start with the same amount of green plants. Assuming that the green plants are digestible by humans, which of the food chains would supply the most energy to humans? *(Circle one number)*

   1 Green plants to humans
   2 Green plants to cattle to humans
   3 Green plants to insects to fish to humans
   4 Green plants to insects to small fish to larger fish to humans
   5 Don't know

7. Any high-speed transmission of energy in the form of particles or electromagnetic waves is called . . .? *(Circle one number)*

   1 convection
   2 radiation
   3 conduction
   4 decomposition
   5 don't know

8. The main source(s) of emissions that have been identified as contributing to acid deposition (acid rain) in the United States are . . . ? *(Circle one number)*

   1 volcanoes and forest fires
   2 petroleum refineries
   3 automobiles and coal burning plants
   4 aerosol sprays and refrigerant leakage
   5 don't know

9. Burning coal for energy . . . ? *(Circle one number)*

   1 releases carbon dioxide and other pollution into the air
   2 decreases needed acid rain
   3 reduces the amount of ozone in the stratosphere
   4 is too expensive
   5 pollutes the water in acquifers
   6 don't know

10. Acid rain is a problem because . . . ? *(Circle one number)*

   1 it may harm plants by affecting their leaves and changing the soil they grow in
   2 it may break down the layer of ozone in the Earth's atmosphere
   3 people may have to stay indoors when it's raining
   4 it may cause a slow change in the Earth's temperature
   5 don't know

11. The energy currently present . . . ? *(Circle one number)*

   1 is all the energy we will ever have
   2 can change form but is never destroyed
   3 can only be used once
   4 is mostly in the form of fossil fuel energy
   5 don't know

12. Which of the following is considered to be a non-renewable energy source (meaning it cannot be replenished)? *(Circle one number)*

   1 Oil
   2 Wood
   3 Biomass
   4 None of the above
   5 Don't know

13. One suggested advantage of using nuclear power plants instead of coal or oil for energy production is . . . ? *(Circle one number)*

   1 nuclear power plants are not expensive to build
   2 the waste products are easy to store
   3 they are totally safe
   4 there is less air pollution
   5 don't know

14. The energy in the food we eat initially came from . . .? *(Circle one number)*

   1 water
   2 the sun
   3 oxygen
   4 none of the above
   5 don't know

15. Humans use energy from coal and oil by burning them. Another source of energy for humans is . . . ? *(Circle one number)*

   1 cold water
   2 a well insulated home
   3 a furnace
   4 the sun
   5 don't know

16. Which type of energy will be available for human use for the longest period of time? *(Circle one number)*

   1 Oil
   2 Coal
   3 Solar energy
   4 Don't know

17. The most prevalent criteria pollutant (index of pollution levels) in Wisconsin is . . . ? *(Circle one number)*

   1 Carbon monoxide
   2 Lead
   3 Sulfur dioxide
   4 Ozone
   5 Don't know

18. Which energy source do scientists think will be in short supply in the next several hundred years? *(Circle one number)*

   1 The wind
   2 Oil
   3 Water flowing over a dam
   4 The sun
   5 Don't know

19. Which of the following offers the most potential for reducing our immediate energy problems? *(Circle one number)*

   1 Geothermal power
   2 Energy conservation
   3 Biomass conversion
   4 Tidal power
   5 Don't know

20. Which form of energy is involved in writing? *(Circle one number)*

   1 Mechanical energy
   2 Kinetic energy
   3 Potential energy
   4 Both 1 and 2
   5 Don't know

21. The process of photosynthesis in green plants . . . ? *(Circle one number)*

- **2 changes light energy into chemical energy**
- **3 changes chlorophyll into sugar**
- **4 is a process used to burn sugar stored in plants so the plants can grow**
- **5 don't know**

22. Electric current is the flow of . . . ? *(Circle one number)*

- **1 energy**
- **2 electrons**
- **3 protons**
- **4 atoms**
- **5 don't know**

23. Most municipal sold waste in the United States is presently disposed of by what method? *(Circle one number)*

- **1 Burning it in closed incinerators**
- **2 Recycling**
- **3 Shipping it out to sea and dumping it**
- **4 Burying it in landfills**
- **5 Don't know**

24. What is the primary renewable resource used in Wisconsin? *(Circle one number)*

- **1 Wood**
- **2 Hydroelectric power**
- **3 Petroleum**
- **4 Solar power**
- **5 Don't know**

Things that Use Energy in Your Home

Now we would like to know about things you use everyday in your home that use energy. Once again, please read the questions carefully and circle the answer that you think is right. If you don't know an answer, please circle "don't know".

25. What type of fuel does the main heating system in your home use? *(Circle one number)*

1 Natural gas
2 Electricity
3 LP Fuel/Oil
4 Wood
5 Other *(Please describe: ____)*
6 Don't know

26. Which of the following items found in many homes uses the most electricity? *(Circle one number)*

1 Lights
2 TV
3 Electric hot water heater
4 Telephone
5 Refrigerator
6 Don't know

27. How often does your family talk about saving energy around the house (for example, shutting off lights when they are not being used, turning down the heat, closing doors and windows)? *(Circle one number)*

1 Never or rarely
2 Occasionally – about twice a year
3 Frequently – about once a month
4 All the time – once a week or more

28. How often does your family talk about energy expenses such as the size of the bill for electricity or home heating, or the cost of gasoline for the car? *(Circle one number)*

1 Never or rarely
2 Occasionally – about twice a year
3 Frequently – about once a month
4 All the time – once a week or more

WHAT ARE YOU WILLING TO DO?

In the next questions we want to know which things you might or might not want to do. There are several sentences below that describe things you might be willing or not willing to do. Please read each sentence and decide if you think that sentence is very true, mostly true, mostly false or very false. If you're not sure, you can circle "not sure". There are no right or wrong answers, we just want to know what you would be willing to do.

29. Here are some statements about some things you might or might not want to do. Please read each one and decide if it is Very True, Mostly True, Mostly False or Very False and circle the correct number. If you're not sure a statement is true or not for you, circle the 3 for Not Sure. *(Circle one number for each statement)*

	Very True	**Mostly True**	**Not Sure**	**Mostly False**	**Very False**
To save water, I am willing to turn off the water when I brush my teeth.	**1**	**2**	**3**	**4**	**5**
I am willing to purchase one product instead of another because it is packaged in reusable, returnable, or recyclable containers or packages.	**1**	**2**	**3**	**4**	**5**
To save energy, I am willing to watch one hour less of TV per day.	**1**	**2**	**3**	**4**	**5**
To reduce air pollution, I am willing to walk, ride my bike, or take the bus instead of using a car.	**1**	**2**	**3**	**4**	**5**
I am willing to throw plastic and glass in a separate recycling trash can.	**1**	**2**	**3**	**4**	**5**
I would rather use paper plates than wash dishes (by hand).	**1**	**2**	**3**	**4**	**5**
I do not want to spend more time learning about energy.	**1**	**2**	**3**	**4**	**5**
I would feel uncomfortable asking someone not to litter.	**1**	**2**	**3**	**4**	**5**

30. Here are some more statements that you can rate as true or false for you. These statements talk about things you may or may not have actually done. Please read each statement and decide if it is Very True, Mostly True, Mostly False or Very False and circle the correct number. If you're not sure a statement is true or not for you, circle the 3 for Not Sure. *(Circle one number for each statement)*

	Very True	Mostly True	Not Sure	Mostly False	Very False
I usually do not read newspaper and magazine articles about energy issues.	**1**	**2**	**3**	**4**	**5**
I try to save water.	**1**	**2**	**3**	**4**	**5**
To save electricity, I turn off lights and appliances when they are not being used.	**1**	**2**	**3**	**4**	**5**
I usually throw my old clothes in the garbage instead of trying to give them to someone else who could use them.	**1**	**2**	**3**	**4**	**5**
I try to talk my friends into recycling pop cans instead of throwing them in the trash.	**1**	**2**	**3**	**4**	**5**
I have walked more places in order to do my part in helping solve pollution problems.	**1**	**2**	**3**	**4**	**5**
I buy things that I want regardless of how they are packaged.	**1**	**2**	**3**	**4**	**5**
I separate things at home for recycling.	**1**	**2**	**3**	**4**	**5**

31. Here is the last list of statements. Once again you have to decide if they are true or false. This time the statements are about the way you feel. Please read each one and decide if it is Very True, Mostly True, Mostly False or Very False for you and circle the correct number. If you're not sure a statement is true or not, circle the 3 for Not Sure. *(Circle one number for each statement)*

	Very True	**Mostly True**	**Not Sure**	**Mostly False**	**Very False**	
I think recycling is worth the effort.	**1**	**2**	**3**	**4**	**5**	
It makes me happy to see people trying to save energy.	**1**	**2**	**3**	**4**	**5**	
I am <u>not</u> concerned about the effects of pollution on my family.	**1**	**2**	**3**	**4**	**5**	
When I have done something that harms the environment I feel there is very little I can do to make it right.	**1**	**2**	**3**	**4**	**5**	
I get upset when I think of things people throw away that could be reused.	**1**	**2**	**3**	**4**	**5**	
I am concerned about environmental health hazards such as those caused by air or water pollution.	**1**	**2**	**3**	**4**	**5**	
Energy problems will only be solved when people like me change the way we live.	**1**	**2**	**3**	**4**	**5**	
I am concerned about how much waste is produced in this country.	**1**	**2**	**3**	**4**	**5**	
Things I do don't have much effect on the energy use in my home.		**1**	**2**	**3**	**4**	**5**
Knowing about environmental problems and issues is important to me.	**1**	**2**	**3**	**4**	**5**	

LEARNING ABOUT ENERGY

The next set of questions asks about where you get information on energy issues, what you learn about energy in school and if you're interested in learning more about energy. In some questions, you may want to circle more than one answer. If the instructions next to the question say "Circle all that apply" then that's okay. Remember, there are no right or wrong answers, we just want to know what you think.

32. The next items describe energy topics that you may or may not have studied in school. Please circle Yes or No to indicate if you studied each topic. *(Circle one answer for each topic)*

Topic	Have you studied this?	
How much energy is stored in foods	**Yes**	**No**
How the sun's energy travels through organisms	**Yes**	**No**
Why energy can neither be created or destroyed	**Yes**	**No**
How some energy becomes unavailable with each energy conversion	**Yes**	**No**
The advantages and disadvantages of nuclear energy	**Yes**	**No**
How motors and generators are used to meet energy needs	**Yes**	**No**
How energy prices are determined	**Yes**	**No**
What can be done to address air pollution	**Yes**	**No**
The kinds of energy used at earlier times in history	**Yes**	**No**
How energy use affects the environment	**Yes**	**No**
How solar or wind energy could be used in your home	**Yes**	**No**
Career opportunities associated with energy development and use	**Yes**	**No**

33. In what class or classes did you learn about these things? *(Circle all that apply)*

0 I haven't learned any of those things in school
1 Science
2 Social Studies
3 Math
4 Tech Ed
5 Family and Consumer Education
6 Business Education
7 Other *(Please describe: ____)*
8 Don't remember

34. Please circle all the ways you have learned about energy issues at school. *(Circle all that apply)*

1 Teachers
2 Textbooks
3 TV programs or videos
4 Computer/Internet
5 Field trips
6 Other *(Please describe: ____)*
7 Don't remember

35. Please circle all the ways you have learned about energy issues at home. *(Circle all that apply)*

1 Family members
2 TV programs or videos
3 Magazines/newspaper articles
4 Computer/Internet
5 Family vacations/trips
6 Other *(Please describe: ____)*
7 Don't remember

ENERGY ACTIVITIES AT SCHOOL

Please imagine that your teacher told you that next week you were going to learn about energy. Your teacher would give you activities to do that would help you learn more about what energy is, how it is used, and ways in which energy use affects the environment.

36. How would you feel about having these types of energy activities in class? *(Circle one number)*

1 I would be excited
2 I would think it was okay
3 I would think it sounded boring
4 I would hate it

(OVER)

37. Below are a list of energy topics you could study in class. On a scale of 1 to 5 with 1 being "Not at all Interested" and 5 being "Very Interested" please tell us how interested you would be in studying each topic. *(Circle one number for each energy topic)*

	Not at all Interested				Very Interested
How much energy is stored in foods	1	2	3	4	5
How the sun's energy travels through organisms	1	2	3	4	5
Why energy can neither be created or destroyed	1	2	3	4	5
How some energy becomes unavailable with each energy conversion	1	2	3	4	5
The advantages and disadvantages of nuclear energy	1	2	3	4	5
How motors and generators are used to meet energy needs	1	2	3	4	5
How energy prices are determined	1	2	3	4	5
What can be done to address air pollution	1	2	3	4	5
The kinds of energy used at earlier times in history	1	2	3	4	5
How energy use affects the environment	1	2	3	4	5
How solar or wind energy could be used in your home	1	2	3	4	5
Career opportunities associated with energy development and use	1	2	3	4	5

38. What are your educational plans after high school? *(Circle one number)*

1 **No future educational plans at the present time**
2 **Vocational/technical school**
3 **College or university**
4 **Military**
5 **Undecided**

39. Are you . . .? *(Circle one number)*

1 **Female**
2 **Male**

Thank you for your time!

APPENDIX C
ANSWER KEYS TO ENERGY KNOWLEDGE QUESTIONS

What Do You Know About Energy?

First, we'd like you to answer some questions about energy. This information will help us understand what you and other students know about energy and what you don't know. So please do your best on each question, but if you really don't know the answer, circle "don't know".

1. What is the Earth's primary source of energy? *(Circle one number)*

   1 Coal
   2 Oil
   3 Sun
   4 Natural gas
   5 Don't know

2. Which of the following energy resources is NOT a renewable energy resource? *(Circle one number)*

   1 Solar energy
   2 Wind energy
   3 Natural gas
   4 Don't know

3. Each and every action on Earth involves . . . ? *(Circle one number)*

   1 food
   2 energy
   3 water
   4 sun
   5 don't know

4. An animal that can get its energy from either producers or consumers is called a . . . ? (*Circle one number)*

   1 herbivore
   2 omnivore
   3 carnivore
   4 don't know

5. A rabbit eats some corn. The energy from the corn goes into the rabbit. The next day a fox eats the rabbit. The fox gets very little of the energy that was in the corn. Why? *(Circle one number)*

   1 A fox can't digest corn
   2 The rabbit has already digested the corn
   3 Corn doesn't have much energy
   4 Most of the corn's energy was used by the rabbit
   5 Don't know

6. Which of the following would give humans the most food energy from 1,000 pounds of plants? Assume the plants are good for people to eat. *(Circle one number)*

   1 Feed the plants to insects, feed the insects to fish, then humans eat the fish
   2 Humans eat the plants
   3 Feed the plants to cattle then humans eat the cattle
   4 Feed the plants to fish then humans eat the fish
   5 Don't know

7. Thermal energy transferred by contact from a warm object to a cooler object is called . . . ? *(Circle one number)*

   1 convection
   2 radiation
   3 conduction
   4 decomposition
   5 don't know

8. Many people believe the Earth's average temperature is changing. They say that one important cause of this change is . . . ? *(Circle one number)*

   1 using fuels like gasoline that burn and release carbon dioxide
   2 the sun is moving closer to the Earth
   3 acid rain
   4 rising ocean levels
   5 don't know

9. Burning coal for energy . . . ? *(Circle one number)*

   1 releases carbon dioxide and other pollution into the air
   2 decreases needed acid rain
   3 reduces the amount of ozone in the stratosphere
   4 is too expensive
   5 pollutes the water in acquifers
   6 don't know

10. Acid rain is a problem because . . . ? *(Circle one number)*

   1 it may harm plants by affecting their leaves and changing the soil they grow in
   2 it may break down the layer of ozone in the Earth's atmosphere
   3 people may have to stay indoors when it's raining
   4 it may cause a slow change in the Earth's temperature
   5 don't know

11. Coal and petroleum are examples of . . . ? *(Circle one number)*

1 fossil fuels
2 renewable sources of energy
3 energy sources that are plentiful
4 alternative sources of energy
5 recycled resources
6 don't know

12. An example of an energy resource that cannot be replenished is . . . ? *(Circle one number)*

1 petroleum
2 trees
3 ocean water
4 animals raised for food
5 don't know

13. One suggested advantage of using nuclear power plants instead of coal or oil for energy production is . . . ? *(Circle one number)*

1 nuclear power plants are not expensive to build
2 the waste products are easy to store
3 they are totally safe
4 there is less air pollution
5 don't know

14. Wood was the main energy resource used in Wisconsin to heat homes in the 1700's. When Wisconsin became an industrial society in the mid-1850's, which of the following became the primary energy source for heating homes? *(Circle one number)*

1 natural gas
2 oil
3 coal
4 propane
5 don't know

15. Humans use energy from coal and oil by burning them. Another source of energy for humans is . . . ? *(Circle one number)*

1 cold water
2 a well insulated home
3 a furnace
4 the sun
5 don't know

16. Which type of energy will be available for human use for the longest period of time? *(Circle one number)*

1 Oil
2 Coal
3 Solar energy
4 Don't know

17. Lights, many kitchen appliances, televisions and computers all require electricity to work. The energy needed to produce electricity comes from . . . ? *(Circle one number)*

1 burning fossil fuels or nuclear resources
2 dams on rivers
3 windmills
4 all of the above
5 don't know

18. Which energy source will be in short supply in the next several hundred years? *(Circle one number)*

1 The wind
2 Oil
3 Water flowing over a dam
4 The sun
5 Don't know

19. Fewer resources are wasted when shoppers buy things that . . . ? *(Circle one number)*

1 are in containers that can be used again
2 have a label saying they are made from natural products
3 are wrapped separately so they stay clean and new looking
4 are disposable
5 don't know

20. Which form of energy is involved in writing? *(Circle one number)*

1 Mechanical energy
2 Kinetic energy
3 Potential energy
4 Both 1 and 2
5 Don't know

21. How do you know that a piece of wood has stored potential energy? *(Circle one number)*

1 It can be converted into other things such as paper and furniture
2 It was once a living thing
3 It releases heat when burned
4 It is a stationary object
5 Don't know

22. Electric current is the flow of . . . ? *(Circle one number)*

1 energy
2 electrons
3 protons
4 atoms
5 don't know

23. Which of the following will help make the amount of garbage going into landfills smaller? *(Circle one number)*

1 Reusing things before we throw them away
2 Reducing the amount of things we use
3 Recycling as much as possible
4 All of the above
5 Don't know

24. What is the primary renewable resource used in Wisconsin? *(Circle one number)*

1 Wood
2 Hydroelectric power
3 Petroleum
4 Solar power
5 Don't know

Things that Use Energy in Your Home

Now we would like to know about things you use everyday in your home that use energy. Once again, please read the questions carefully and circle the answer that you think is right. If you don't know an answer, please circle "don't know".

26. Which of the following items found in many homes uses the most electricity? *(Circle one number)*

1 Lights
2 TV
3 Electric hot water heater
4 Telephone
5 Refrigerator
6 Don't know

What Do You Know About Energy?

First, we'd like you to answer some questions about energy. This information will help us understand what you and other students know about energy and what you don't know. So please do your best on each question, but if you really don't know the answer, circle "don't know".

1. What is the Earth's primary source of energy? *(Circle one number)*

   1 Coal
   2 Oil
   3 Sun
   4 Natural gas
   5 Don't know

2. Which of the following energy resources is NOT a renewable energy resource? *(Circle one number)*

   1 Solar energy
   2 Wind energy
   3 Natural gas
   4 Don't know

3. When a light bulb is turned on, some of its energy is used to emit light. The rest of its energy is. . . ? *(Circle one number)*

   1 stored for future use
   2 lost in waste heat
   3 stays in the light bulb and cannot be used
   4 don't know

4. It is impossible to . . . ? *(Circle one number)*

   1 convert chemical energy to heat energy
   2 measure the amount of heat energy in foods
   3 build a machine that produces more energy than it uses
   4 none of the above
   5 don't know

5. A rabbit eats some corn. The energy from the corn goes into the rabbit. The next day a fox eats the rabbit. The fox gets very little of the energy that was in the corn. Why? *(Circle one number)*

   1 A fox can't digest corn
   2 The rabbit has already digested the corn
   3 Corn doesn't have much energy
   4 Most of the corn's energy was used by the rabbit
   5 Don't know

6. Each of the following food chains start with the same amount of green plants. Assuming that the green plants are digestible by humans, which of the food chains would supply the most energy to humans? *(Circle one number)*

1 Green plants to humans
2 Green plants to cattle to humans
3 Green plants to insects to fish to humans
4 Green plants to insects to small fish to larger fish to humans
5 Don't know

7. Any high-speed transmission of energy in the form of particles or electromagnetic waves is called . . .? *(Circle one number)*

1 convection
2 radiation
3 conduction
4 decomposition
5 don't know

8. The main source(s) of emissions that have been identified as contributing to acid deposition (acid rain) in the United States are . . . ? *(Circle one number)*

1 volcanoes and forest fires
2 petroleum refineries
3 automobiles and coal burning plants
4 aerosol sprays and refrigerant leakage
5 don't know

9. Burning coal for energy . . . ? *(Circle one number)*

1 releases carbon dioxide and other pollution into the air
2 decreases needed acid rain
3 reduces the amount of ozone in the stratosphere
4 is too expensive
5 pollutes the water in acquifers
6 don't know

10. Acid rain is a problem because . . . ? *(Circle one number)*

1 it may harm plants by affecting their leaves and changing the soil they grow in
2 it may break down the layer of ozone in the Earth's atmosphere
3 people may have to stay indoors when it's raining
4 it may cause a slow change in the Earth's temperature
5 don't know

11. The energy currently present . . . ? *(Circle one number)*

1 is all the energy we will ever have
2 can change form but is never destroyed
3 can only be used once
4 is mostly in the form of fossil fuel energy
5 don't know

12. Which of the following is considered to be a non-renewable energy source (meaning it cannot be replenished)? *(Circle one number)*

    1 Oil
    2 Wood
    3 Biomass
    4 None of the above
    5 Don't know

13. One suggested advantage of using nuclear power plants instead of coal or oil for energy production is . . . ? *(Circle one number)*

    1 nuclear power plants are not expensive to build
    2 the waste products are easy to store
    3 they are totally safe
    4 there is less air pollution
    5 don't know

14. The energy in the food we eat initially came from . . .? *(Circle one number)*

    1 water
    2 the sun
    3 oxygen
    4 none of the above
    5 don't know

15. Humans use energy from coal and oil by burning them. Another source of energy for humans is . . . ? *(Circle one number)*

    1 cold water
    2 a well insulated home
    3 a furnace
    4 the sun
    5 don't know

16. Which type of energy will be available for human use for the longest period of time? *(Circle one number)*

    1 Oil
    2 Coal
    3 Solar energy
    4 Don't know

17. The most prevalent criteria pollutant (index of pollution levels) in Wisconsin is . . . ? *(Circle one number)*

1 Carbon monoxide
2 Lead
3 Sulfur dioxide
4 Ozone
5 Don't know

18. Which energy source do scientists think will be in short supply in the next several hundred years? *(Circle one number)*

1 The wind
2 Oil
3 Water flowing over a dam
4 The sun
5 Don't know

19. Which of the following offers the most potential for reducing our immediate energy problems? *(Circle one number)*

1 Geothermal power
2 Energy conservation
3 Biomass conversion
4 Tidal power
5 Don't know

20. Which form of energy is involved in writing? *(Circle one number)*

1 Mechanical energy
2 Kinetic energy
3 Potential energy
4 Both 1 and 2
5 Don't know

21. The process of photosynthesis in green plants . . . ? *(Circle one number)*

1 uses sunlight to burn energy in plants
2 changes light energy into chemical energy
3 changes chlorophyll into sugar
4 is a process used to burn sugar stored in plants so the plants can grow
5 don't know

22. Electric current is the flow of . . . ? *(Circle one number)*

1 energy
2 electrons
3 protons
4 atoms
5 don't know

23. Most municipal sold waste in the United States is presently disposed of by what method? *(Circle one number)*

1 Burning it in closed incinerators
2 Recycling
3 Shipping it out to sea and dumping it
4 Burying it in landfills
5 Don't know

24. What is the primary renewable resource used in Wisconsin? *(Circle one number)*

1 Wood
2 Hydroelectric power
3 Petroleum
4 Solar power
5 Don't know

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Now we would like to know about things you use everyday in your home that use energy. Once again, please read the questions carefully and circle the answer that you think is right. If you don't know an answer, please circle "don't know".

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3 Electric hot water heater
4 Telephone
5 Refrigerator
6 Don't know

Report Summary

K-12 Energy Education Program Baseline Study

An Evaluation of Teacher Practices and Student and Parent Learning

June 1999

Project Manager

Craig Schepp
Energy Center of Wisconsin

Consultant

Hagler Bailly Consulting, Inc.

To Order the Full Report

Call (608)238-4601 or send email to orders@ecw.org. Ask for the KEEP Baseline Study, publication number 188-1.

About Us

The Energy Center of Wisconsin is a private nonprofit organization dedicated to improving energy efficiency in Wisconsin. Funded primarily by Wisconsin utilities, the Center spends $4.5 million annually on energy efficiency research, education, and demonstrations aimed at residents, businesses, and government.

Report Summary

The Wisconsin K-12 Energy Education Program (KEEP) was created in 1993 to help promote energy education in Wisconsin. As a sponsor of KEEP, the Center is evaluating how effectively the KEEP approach ultimately affects learning, attitudes, and behavior among students and their families. This report summarizes the results of the first phase of the evaluation: to collect baseline data on the current status of energy education in Wisconsin's public schools before the KEEP program is implemented. The findings of the baseline study measure:

- How teachers are currently teaching energy in Wisconsin schools
- Students' and parents' knowledge of the four KEEP energy themes and their attitudes/practices regarding energy usage

The ultimate goal of KEEP is to provide the knowledge and skills necessary to help future energy consumers in Wisconsin make informed decisions about energy use. The two major tools of the program are the *Energy Education Conceptual Framework and Suggested Scope and Sequence* and the *Energy Education Activity Guide.* The conceptual framework of KEEP divides energy education into four themes that build upon each other: Theme I: We Need Energy; Theme II: Developing Energy Resources; Theme III: Effects of Energy Resource Development; and Theme IV: Managing Energy Resource Use.

Methods

The target population for the baseline survey was restricted to students enrolled in Wisconsin public schools in grades 4 through 12 and their teachers.

Students and Parents

The 428 school districts in Wisconsin were each placed into one of four school-sized strata. Each strata had approximately equal numbers (150,000) of 4^{th} – 12^{th} graders. Districts were randomly sampled out of each strata. Because the surveys were conducted in person, districts that were considered to be geographic outliers were eliminated from the sample. A total of 21 districts were selected for the study (approximately 88 students per grade).

Two versions of the 12-page survey were used—one for 4^{th} – 6^{th} graders and one for 7^{th} – 12^{th} graders. Research analysts from Hagler Bailly administered the survey to students in the classroom. Depending on the grade level, slightly different procedures were used to administer the survey. For all grades, the research analyst gave a short introduction to the survey and was available to answer questions during the survey administration. All students participating in the survey were also given a 12-page booklet for their parents to complete. The parent survey was very similar in design to the 7^{th} – 12^{th} grade booklet. A total of 819 students and 421 parents completed surveys.

Teachers

Science, mathematics, social studies, language arts, technology education, family living and consumer education teachers in grades 4 – 12 were selected as the target population. A database of all staff working in the Wisconsin K-12 Public School System during the 1997 – 1998 school year was obtained from the Department of Public

Instruction. A random sample of 500 was selected from a sample frame of 14,741 teachers. A total of 283 surveys were completed by teachers, representing a response rate of 58 percent. Based on a comparison analysis, the characteristics of the respondents were determined to be representative of the target population.

Findings

What Are Students Learning?

- Three-quarters of the students have studied at least one of the KEEP themes.
- Most learned about energy in a science class.
- When quizzed about their specific energy knowledge, students scored an average of 50 percent overall. They scored the highest on Theme IV: Managing Energy Resource Use (62%) and the lowest on Theme II: Developing Energy Resources (45%).

Although the baseline study was not designed to determine the causal relationship between students' energy knowledge and their energy-related behavior, the data were examined to assess the strength of this relationship. Students with higher energy knowledge scores were more willing to take energy conservation actions, to report having taken such an action in the past, and to have more positive attitudes toward energy conservation and education.

One plausible hypothesis for this finding is that increased energy knowledge may lead to an increase in positive attitudes and commitment to energy conservation behavior. However, the reader should keep in mind that while the differences between students with high versus low energy scores were statistically significant (based on a 95% confidence interval), factors outside the scope of the baseline study could also have contributed to this relationship.

Who Is Teaching Energy?

A majority (53%) of Wisconsin teachers in the target population already infuse the subject of energy into their classroom curriculum. These teachers have the following characteristics:

- They are more likely to teach science or technical education and to also teach in rural schools.
- The majority of them (62% or more) teach all four KEEP energy themes, with Theme IV (Managing Energy Resource Use) being taught by the most teachers (69%).
- Compared to those who do not teach about energy, they tend to use a greater range of teaching materials, including the Internet, videos, and novels.
- Sixty seven percent of the classes where energy is taught are at the high school level.

Even though most students learn about energy concepts and topics in at least one class, a large proportion of teachers in the target population do not currently teach their students about energy. These teachers named two factors that would influence them to include energy issues in their curriculum:

- Better access to resources and aids for teaching about energy
- More inservice classes on energy education teaching methods

What Role Do Parents Play?

- Parents achieved an average of 60 percent correct responses across all KEEP energy themes. They were most knowledgeable about Theme IV (Managing Energy Resource Use). Differences between higher- and lower-scoring parents on willingness to conserve, commitment to conservation, and energy attitudes were only marginally significant (statistically).
- Even though the relationship is not as strong as for students, the data show that willingness to conserve, commitment to conservation, and positive attitudes toward energy-related issues all tend to be higher among parents with higher knowledge scores.

These two findings suggest that if KEEP is successful at increasing energy knowledge throughout the state by reaching parents through their student children, it could lead to increased energy conservation actions and support for energy education programs.

The relationship between parents' energy knowledge and their child's energy knowledge and behaviors:

- Students whose parents' energy knowledge was high were more likely to have higher energy knowledge scores themselves. This correlation was statistically significant.
- In addition, children whose parents had a high overall energy knowledge score (70% or higher) were more likely to say they had actually performed energy conservation actions compared to children whose parents had lower scores. However, the differences between these same students' willingness to conserve energy and overall energy attitudes were only marginally significant (statistically).

Parental support and household activities can be used to make energy education more effective.

- Nearly all parents who completed a baseline survey support energy education for their children. Compared to students, parents also consistently report higher energy knowledge scores, more positive attitudes toward energy and resource conservation, and higher levels of actual conservation behaviors.

Energy education programs could capitalize on this strong base of parental support and current household energy conservation activities to increase students' awareness and enthusiasm for energy topics and concepts. Especially for younger students, awareness of their parents' support for energy conservation will make them more willing to talk to other students about energy topics and the need to conserve and use energy wisely. For older students, energy education activities that involve studying their own household behaviors may influence parents and other family members to explore other behaviors that reduce energy consumption or increase energy efficiency.

Who Is Interested in an Energy Education Program?

Parents and Students

Almost all of the parents (99%) said they would find value in activities at school that taught their child what energy is, how it is used, and ways in which energy use affects the environment. Of the students, seventy-four percent responded positively to these types of energy activities.

Teachers

In contrast to parents' and students' interest in energy activities, less than a third of the teachers (30%) were very interested in attending a training for an energy education program. The general characteristics of interested teachers are summarized below.

- Interested teachers were slightly more likely to teach in a rural setting (40% compared to 33%).
- Not surprisingly, science teachers (47%) were the most interested in attending energy education training.
- Teachers who are currently including the topic of energy in their classroom curriculum are more likely to be interested in the training (78% compared to 42%).
- The majority of interested teachers use a variety of teaching materials, such as videos (95%), magazine articles (77%), newspaper articles (71%), activity guides (68%), and the Internet.

What Can Be Done to Help Promote KEEP?

Based on the results of the baseline survey, several recommendations can be made to help KEEP reach the largest audience of people:

- Science teachers in rural areas are the best target for the KEEP program. They are the most interested in the program and already teach some energy-related activities. Therefore, they will be the easiest teachers to reach in the short term.
- Non-science teachers are less likely to be interested in KEEP and currently do not include energy-related activities in their curricula. One of the barriers to teaching energy is that these teachers feel energy is not appropriate for their subject matter. KEEP promotional materials need to appeal to a wide audience and convince non-science teachers that the KEEP energy activities can complement their current lesson plans.
- The two things that would have the largest influence on non-energy teachers including energy in their curricula would be better access to resources and aids for teaching about energy and more inservice classes on energy education teaching methods. KEEP does just that. Marketing efforts should be increased so more teachers are aware of the benefits of KEEP.
- The majority of parents and students support energy education. If school district administrators were aware of this, they might agree to schedule a KEEP inservice at one of their schools. This would allow a large number of teachers to have easy access to KEEP training.
- The data suggest that increased energy knowledge may increase the level of energy conservation behaviors among students. Groups that are interested in promoting energy conservation behavior may be interested in helping promote KEEP as well.
- The data also suggest that students with high knowledge scores tend to have parents with high knowledge scores. An ancillary program that included some adult education activities is a possible next step for KEEP to increase the overall effect of the program on Wisconsin students.

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