

**DEVELOPING, EVALUATING, AND DISSEMINATING AN ENERGY
EDUCATION RESOURCE TRUNK**

by

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submitted in partial fulfillment of the
requirements for the degree

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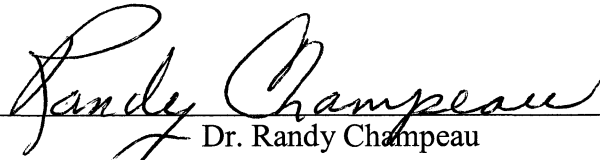
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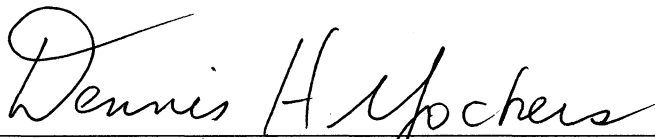
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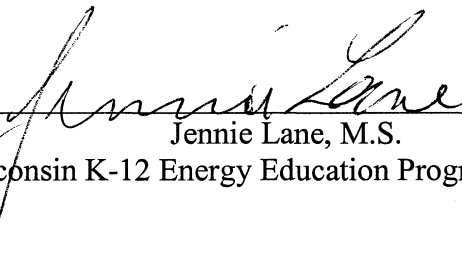
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This work is dedicated to the memory of my Oma, Dora Devol Brett, whose
boundless love and spirited nature will always be an inspiration to me.

ABSTRACT

The purpose of this project was to develop, pilot, evaluate, and disseminate an Energy Education Resource Trunk to address a stated need by teachers for more resources to help them teach about energy.

The Energy Trunk is a product of the Wisconsin K-12 Energy Education Program (KEEP), an organization dedicated to promoting energy education throughout the state of Wisconsin. KEEP provides many resources to teachers such as the *KEEP Activity Guide* and graduate level energy education courses. In 2000-2001, the program held a series of focus groups around the state, which asked teachers what programs, projects, and resources KEEP should develop to make energy education more effective and fun. Teachers' number one response was that they wanted more resources and support materials to help them teach about energy. Teachers lack hands-on, minds-on energy resources that are organized together in an accessible, user-friendly fashion.

To address this need, an Energy Trunk was developed to include effective resources based on the audience, trunk themes and activities, availability of resources, and feedback and review by KEEP Adjunct Faculty and graduate committee members.

Eight trunks were piloted through a nonrandomized control group pretest-posttest design in October and November 2002. Teacher and student evaluation of the trunk, via questionnaires and pre/posttests, concluded that the trunk is effective both as an engaging resource for students and as a valuable teaching tool for teachers.

A dissemination strategy has been recommended based on research gathered from trunk program interviews and from the Energy Trunk pilot. Dissemination of Energy Education Resource Trunks will likely result in an increase in energy education because teachers will have access to a "ready-to-go," effective teaching resource. This increase in energy education through the use of a stimulating resource has the potential to show increasing numbers of students how energy is connected to their lives and how they have the ability to make choices that positively affect the sustainability of our energy resources.

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CHAPTER ONE

THE PROBLEM AND ITS SETTING

The Importance of the Study

Environmental education (EE) plays a vital role in today's society. It has become clear that the health of our environment, and life itself, rests on the education and consequential actions of present and future generations. A fundamental environmental topic of our day is energy. Everything that we do is connected to energy. The sun's energy produces food needed to fuel our bodies and minds and give us energy to carry out our daily activities. We need energy to power heating and cooling, lighting, transportation, technology, and more – all items that we are dependent on each day of our lives.

Because of the great dependence we have on energy, an understanding of what energy is, how we develop it, the effects of its development, and how we manage it, is essential not only to a healthy environment, but to a prosperous economy as well. If we hold a short-term vision for how we obtain energy, for example through a reliance on non-renewable sources, then we are not providing for our needs in the future, neither through enduring sources of energy nor a healthy environment.

One mechanism for increasing society's understanding of our interconnection to energy is education. Programs that focus on energy education have begun to be generated in recent years. One such program is the Wisconsin K-12 Energy Education Program (KEEP). The goal of KEEP is to improve and increase energy education in

Wisconsin K-12 schools by developing and implementing energy education resources and programs (KEEP, 1997). As of February 27, 2003, approximately 1,700 Wisconsin K-12 teachers have participated in a KEEP course called "Environmental Education Curriculum Resources: Wisconsin K-12 Energy Education Program." During the course, each teacher receives the *KEEP Activity Guide*, an extensive compilation of energy activities and resources. While the guide has been extremely helpful for teachers in terms of giving them actual activities to conduct with their classes to help their students understand energy-related concepts, more is still needed.

KEEP conducted a Nominal Group Assessment in 2000 and 2001 to determine where improvements could be made to strengthen its program. The most prevalent request made by teachers who have been through the KEEP course was access to more resources that will support them in leading energy lessons and activities.

The focus of this project was to address this need and develop an energy trunk that supports teachers by providing more hands-on resources and other support materials. The goal of the Energy Education Resource Trunk is to strengthen energy education in Wisconsin by empowering teachers and providing students with the necessary tools to better understand and become more engaged in how energy is connected to their lives. Strengthening energy education is an important step in educating the next generation of leaders. These leaders will make decisions and take actions that have the potential to make a positive impact on the management of our energy resources, resulting in a more sustainable future.

The Statement of the Problem

The purpose of this study is to develop and evaluate an energy education resource trunk, and to recommend a strategy for its dissemination.

The Subproblems

1. Are EE trunk programs effective in an educational setting, and what are the various components of an EE trunk program?
2. What resources should be included in the Energy Trunk?
3. To what extent is the Energy Trunk effective?
4. What is the best strategy for disseminating the Energy Trunks?

The Limitations

1. The study will not compare the effectiveness of trunks with that of other tools used in environmental education.
2. The classes that will have the pilot trunks will not be selected randomly, but rather based on the willingness of KEEP teachers in Wisconsin to pilot the trunk in their classroom.
3. The resource trunk will not aim to be an exhaustive resource for hands-on tools in energy education.
4. The resource trunk will not be suitable for all grade levels and subject areas.

Definitions of Terms

<u>Dissemination Strategy</u>	A dissemination strategy is a plan for distributing a particular product, plan, or concept.
<u>Educational Resource</u>	An educational resource is an item whose goal is to provide strength and support to the study of a particular concept or issue. Examples of educational resources include books, games, maps, computers, and manipulative equipment.
<u>Energy</u>	Energy is the ability to organize or change matter, or the ability to do work (<i>Know the Flow of Energy in Your School</i> , 2001).
<u>Energy Education</u>	Energy Education refers to teaching energy concepts and energy-related environmental issues (Koop, 1999).
<u>Energy Literacy</u>	Energy literacy refers to knowledge of energy concepts, and the possession of skills and motivation to analyze energy-related environmental issues. An energy literate person is one who works individually or collectively to solve energy-related problems and to prevent new ones (Koop, 1999).
<u>Environmental Education</u>	Environmental Education helps students become environmentally aware, knowledgeable, skilled, dedicated citizens who are committed to work, individually and collectively, to defend, improve, and sustain the quality of the environment on behalf of present and future generations of all living things (Engleson and Yockers, 1994).
<u>KEEP Adjunct Faculty</u>	KEEP Adjunct Faculty are a group of twenty university approved teacher educators and energy resource managers who teach the KEEP course throughout the state of Wisconsin.
<u>KEEP Teachers</u>	KEEP teachers are teachers who have gone through a Wisconsin K-12 Energy Education Program course. They have an understanding of the KEEP program, its resources, and how to use the KEEP Activity Guide as a resource to support their curriculum.

Resource trunk or kit

A resource trunk or kit refers to a mobile container that holds several hands-on, and other, resources, to help individuals better understand a concept or issue.

Abbreviations

- KEEP refers to the Wisconsin K-12 Energy Education Program
- EE refers to Environmental Education

Assumptions

1. Teachers surveyed will respond to questions honestly.
2. Students will respond to evaluations honestly.
3. Although selection of classes where the trunks will be piloted will not be random, the student samples should be diverse enough to use as a legitimate evaluation tool in determining the effectiveness of the trunks.

CHAPTER TWO

REVIEW OF THE RELATED LITERATURE

The literature review will cover the following topics:

- I. The EE Movement and How Energy Education Fits Within It**
- II. The Need for More Hands-on Resources in EE, and Specifically Energy Education**
- III. Evidence of Trunk Program Success in an Educational Setting**
- IV. Interview and Questionnaire Techniques**
- V. Strategies for Pilot-testing and Evaluating Educational Products, with an Emphasis on Resource Trunks**
- VI. Chapter Summary**

I. The EE Movement and How Energy Education Fits Within It

Beginning in the 1800s, stimulus for the current environmental education movement began to occur with nature education, which was followed by conservation education and then outdoor education (Swan, 1975; National Association of Conservation Districts and EETAP, 1998). As greater effects of the Industrial Revolution of the twentieth century began to be felt in the quality of our air, water, and more, it became clear that we needed to find ways to address these issues. Environmental education was seen by many as a method for addressing the multiple complex environmental problems of our day. One of the main instigating factors in

the development of the environmental education movement was the 1972 United Nations Conference on the Human Environment, which recommended that every nation promote and develop environmental education programs (Engleson and Yockers, 1994). Following this conference, in 1977 the Tbilisi Conference on Environmental Education released the Tbilisi Declaration which stated that the three broad goals of environmental education are: to foster a clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas; to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment; and to create new patterns of behavior of individuals, groups and society as a whole towards the environment.

Environmental education should prepare the individual for life through an understanding of the major problems of the contemporary world (Tbilisi, 1978). Energy supply and demand is clearly a major problem of the contemporary world, as we see from its constant presence in the media, and political and social arenas. Energy is central to all activity, and serves as a connection between nature and life itself (National Energy Education Development Project, 1994). Energy is necessary for maintaining one's health, well-being, lifestyle, and more; every interaction among living and non-living things has an associated transfer and conversion of energy (KEEP, 1997). Through the study of energy issues, the individual is able to gain a clear sense of how we are vitally linked to nature. In addition, one can see how the knowledge we obtain and choices we make with respect to energy and the environment will affect not only the environment, but also the health of the individual,

as well as that of our economy. Since energy plays an essential role in peoples' lives, the study of energy and energy issues should be emphasized in education (KEEP, 1997).

Aldo Leopold said, "We abuse the land because we regard it as a commodity belonging to us. When we see land as a commodity to which we belong, we may begin to use it with love and respect" (Leopold, 1949). Energy education instills within the learner a greater feeling of connectedness to nature. We are able to see the necessity of energy resources in our daily needs and activities. We see the dependence that we have on natures' resources and so develop a greater respect for it and their corresponding sustainability.

One of the main subgoals of EE is to help individuals develop the skills needed to identify, investigate, and take action toward the prevention and resolution of environmental issues (Engleson and Yockers, 1994; The Tbilisi Declaration, 1977). In order for students to mature into active environmental stewards who can take action on the resolution of environmental issues, it is necessary for them to be faced with tasks that are challenging; yet not overwhelming. Energy concepts are a perfect example of a mechanism that can be used for providing students with information on environmental issues that they can work towards understanding and evaluating for possible solutions (Snyder, 1994). Though students generally are not able to fully apply energy concepts in ecological contexts and evaluate solutions until they are in their teens, it is beneficial for younger students to gain an awareness and understanding of some energy concepts to provide a foundation for later years (Snyder, 1994). In addition, social and emotional development are often central goals

of nonformal education programs and energy and environmental education projects can offer opportunities to advance this growth (Snyder, 1994).

According to Snyder and the 1994 National Energy Education Review team, energy education and learning about the flow of energy does the following:

- ❖ Offers an ecologically sound standard for measuring environmental impact.
- ❖ Focuses attention on the connections among environmental issues, allowing more creative thinking about potential solutions.
- ❖ Helps to keep a broader, longer-term perspective on the sensational environmental issues that capture short-term media interest.

Clearly, energy education is an important element of environmental education and should be a focus area in the continued development of EE programs.

II. The Need for More Hands-on Resources in EE, and Specifically Energy Education

There has been significant growth in the number of valuable environmental education programs world-wide. For example, the National Environmental Education Act of 1970 (and 1990, when it was reinstated), called for the Environmental Protection Agency to administer programs including environmental education training, grants, awards, internships, and fellowships and a national environmental education advisory council. Yet, as in most fields, there continues to be room for improvement within the field of environmental education. In 1996, challenges to environmental education were identified by the National Environmental Education Advisory Council at the Environmental Protection Agency to include, "limited

resources to sustain programs over the long-term, gaps in program development and access to quality materials...” This finding by the Council expresses a fairly widespread need for more resources and materials to support environmental education efforts.

As of 1980, Champeau, Gross, and Wilke found that the majority of teachers in Wisconsin did not have the knowledge or skills to instruct students in environmental education. Teacher certification requirements have changed in Wisconsin so that now environmental education training is required of the science, social studies, early childhood, elementary, middle, and agriculture teachers before they can obtain a license to teach (Engleson, 1985). Though the lack of knowledge and skills were attempted to be addressed by the tightened teacher certification requirements, barriers to the most effective implementation of an environmental education program may still be present.

Educational Barriers

One type of barrier is an “educational” barrier. An educational barrier is one in which an individual perceives that their lack of knowledge and understanding of a particular set of concepts or ideas is below what is needed to teach the subject matter (Ham and Sewing, 1987). There are many ways to address the educational barriers felt by teachers. One of the ways is to provide them with resources to support their own understanding of, in this case, environmental or energy concepts, and their ability to teach the subject matter with confidence and comfort. An energy resource trunk has the potential to provide teachers with a compilation of hands-on energy

related resources and corresponding activities to enable them to teach about energy with greater comfort and ease.

Logistical Barriers

Another type of barrier is the logistical barrier, which according to Ham and Sewing, teachers see as the most critical obstacle to environmental education. Some of the top logistical barriers are a lack of time, funding, and resources (Ham and Sewing, 1987; Tewksbury and Harris, 1982; Pettus and Teates, 1983; Spork, 1992).

Recent studies support that a lack of resources currently serves as a logistical barrier for teachers. Lane's study surveyed over 900 teachers, of which 290 said that they do not teach about the environment. The second most popular response of the 290 teachers to what would influence them the most to infuse environmental concepts into their classroom teaching was better access to resources (1993).

"Teachers need a greater variety of 'resources,' more than just printed materials, to address their desired environmental education goals" (Dixon, 2001). Dixon's (2001) study concluded that out of 42 natural resource topics and environmental issues [including energy issues] only 10 had 50% or more of the teachers feeling that they had sufficient resources to teach that topic or issue. No topic resulted in more than 66% (water cycle) of the teachers responding that there were sufficient resources. In addition, more than half of the survey respondents rated videos (59%) and specimens for classroom use (53%) as important resources. And nearly half of respondents rated field equipment (46%) and models and displays (49%) as important environmental resources.

In the Nominal Group Assessment done by the Wisconsin K-12 Energy Education Program (KEEP) between September 2000 and September 2001, almost one hundred K-12 teachers participated with comments and responses to questions about the KEEP program. When asked, "What programs, projects, and/or resources should KEEP develop to make energy education more effective and fun?" the most popular response by the teachers was "more resources to help teach about energy." Teachers emphasized the desire for more hands-on and minds-on experiences in energy education.

Hands-on Resources in Energy Education

According to Edgar Dale's (1969) Cone of Learning (Appendix A), hands-on, experiential learning is more effective than passive involvement, such as reading and hearing, in helping the learner to remember material. Resource trunks or kits are tools that are used to give the learner more hands-on, experiential learning. Activities from resource trunks may contain various teaching techniques. Some of these techniques include discovery, displays, exhibits, experiments, games, models, pictures, samples, videotaping, and more (Maxwell, 1983). These resources provide individuals with the chance to explore an issue in depth and develop a sense of expertise (Snyder, 1994). In addition, learning through experience has become a very popular form of helping students develop practical knowledge and life skills (Resnick and Chi, 1988). Trunks also may provide an element of fun to an energy education program. An element of fun is encouraged since environmental issues can sometimes be a bit overwhelming

for students. When a program has components that are “fun,” students’ imagination, creativity, and enthusiasm are engaged (Snyder, 1994).

III. Evidence of Trunk Program Success in an Educational Setting

An investigation into the existence of literature documenting evidence of trunk program success in an educational setting found that there is little literature on the topic. The investigation consisted of a search through the Ebscohost databases (including ERIC, Academic Search Elite, and MasterFILE Premier), the Internet, the American Association of Museums website, and the National Science Teachers Association website; and an inquiry made to existing trunk programs of known literature documenting such evidence.

There are a fair amount of reports and articles that discuss the positive links between environmental education and hands-on learning with heightened interest and improved overall learning. As stated in “The Educational Efficacy of Environmental Education” interim report, “environmental education has much to offer the education reform movement. Fundamental to EE are pedagogical methods that include: hands-on activities; relevant subject matter; and topics that engage students, encouraging their active participation” (Hoody, 1995). Assumptions can be made that trunks are successful because of their focus often being related to EE and also because of their hands-on approach; yet, it is advantageous to have further information that supports this assumption.

One recent study evaluated the impact of the Holocaust Museum Houston Curriculum Trunk Program (therefore, not an EE-based trunk program) on students' Holocaust knowledge, attitudes, and their understanding of the notion of responsibility. It was stated that the "results suggested that students who participated in the current program displayed an increase in Holocaust knowledge and more culturally tolerant attitudes as a result of training" (Elmore, 2002).

Colleen Laborde, Associate Director of Educational Outreach, coordinates the Holocaust Museum in Houston's traveling trunk program. Laborde (2002) says that the trunk program has been very successful. "When we explain to teachers that we have already compiled all of the materials they need to teach a unit on the Holocaust, their faces light up. We are pleased with the number of teachers who use our trunks year after year. Many of the teachers request the trunk up to a year in advance to guarantee they will have this resource for their classroom." Some quotes from teachers about the Holocaust trunk include:

- ❖ "The knowledge that the students came away with was more than I ever expected."
- ❖ "My kids really enjoyed the materials and it helped put a better understanding of the atrocities of the Holocaust in their hearts and heads."
- ❖ "The trunk fit right in with our study and just its presence in our room stood as a reminder of all that we were learning."

An investigation into the topic of trunk program success in an educational setting surfaced another program that is run by the Einstein Project, and which has conducted research on the topic under discussion. The Einstein Project is a nonprofit corporation dedicated to improving the quality of science, mathematics and

technology education for K-12 students in Wisconsin. They lease hands-on science units as kits to schools for eight weeks. The kits come back to the Einstein Project's Resource Center and are restocked and reviewed through an evaluation process. This process of leasing out hands-on kits to teachers, receiving them back after a number of weeks, and then restocking and evaluating how they did in the classroom is similar to many trunk programs throughout the country. What is different about the Einstein Project is that they have commissioned fairly in depth effectiveness studies concerning whether students taught with their materials learn more effectively than students taught with a more traditional textbook based curriculum (The Einstein Project, 2003). Research that came out of their Cornerstone Study, conducted by the St. Norbert College Survey Center in 1999 concluded that Einstein students:

- ❖ Performed better than non-Einstein students when combining all the assessments, using Weighted Index Scores (Einstein 76.8; non-Einstein 64.0).
- ❖ Did significantly better than non-Einstein students when asked to perform a task, investigate, classify, arrange, draw and label, describe, or explain a scientific phenomenon.
- ❖ Learn through the process of "doing science." They master concepts from experience rather than from just reading.
- ❖ Actually "use" scientific terms to communicate; terms are not merely read and memorized.

Data obtained from the studies discussed above suggest that trunk programs are successful in an educational setting. However, due to an overall lack of documentation discussing how effective trunk programs, especially those with a focus on EE, are in a formal or non-formal educational setting, it was necessary to obtain

further information directly from existing trunk programs. Information obtained from the programs can be found in Chapter Four.

IV. Interview and Questionnaire Techniques

In order for useful resources, like traveling trunks, to be created for teachers, various types of information must be obtained. An understanding of the range of methods that can be used to obtain information was useful. The interview is “essentially a method of collecting information” (Richardson, Dohrenwend, and Klein, 1965). It has been more scientifically defined as a “process of dyadic, relational communication, with a predetermined and serious purpose designed to interchange behavior and involving the asking and answering of questions” (Stewart and Cash, 1991). Other methods of data collection are observation and documentation, a form of which is “elicited” documents, including questionnaires (Richardson, Dohrenwend, and Klein, 1965). As one might expect, there are pros and cons to each form of data collection. A benefit to using interviewing over observation and documentation is that the investigator can always check her interpretation of the data with the respondents. However, questionnaires and other forms of documentation may prove to be much more economically feasible (Richardson, Dohrenwend, and Klein, 1965).

There are criteria that should be assessed before selecting a data collection method. The criteria include: 1) Accessibility- whether or not the information is obtainable and whether the owner is willing to make it available; 2) Economy of

Resources- refers to a cost comparison of the various methods; 3) Accuracy- determine what the desired level is and be aware that inaccuracy can occur with all methods of data collection; and 4) Relevance- refers to how much of what one collects through each method will be relevant to her research study (Richardson, Dohrenwend, and Klein, 1965).

According to Jackson and Rothney (1961), there are significant differences in results of the two methods (interview and questionnaire) including depth of response, completeness of return, nature and quality of answers, and expense involved. In their study, the mailed questionnaire produced 83.3 percent response and the interview produced a total of 98.1 percent completion. While this statistic shows support for using the interview method, they also found that for every dollar spent on the mailed questionnaire, roughly sixty dollars were spent on the interview process. Additional findings of their report included that interviews drew remarkably more complete answers than the mailed questionnaires; respondents of both responded more consistently to items that asked for factual data or yes/no check answers, as opposed to open-ended questions; and the length of the mailed questionnaire negatively influenced the amount of items that were completed.

Structuring is an important element of interviewing, as well as eliciting responses to questionnaires, because it involves the ability to complete an organized initial interview (or questionnaire) while developing a relationship with the respondent that will foster the transfer of information (Evans, Hearn, Uhlemann, and Ivey, 1984). Structuring is used to initiate the interview/questionnaire, provide the respondent with information about the goals of the interview/questionnaire, facilitate

the objectives of the interview/questionnaire in terms of the research study, and conclude the interview/questionnaire (Evans, Hearn, Uhlemann, and Ivey, 1984). Basically, structuring involves three components: 1) an opening, 2) a body, and 3) a closing (Stewart and Cash, 1991).

Part of structuring an interview or questionnaire involves deciding what types of questions are going to be asked, as well as how they are going to be asked. There are three characteristics of questions according to Stewart and Cash (1991): 1) open or closed, 2) primary or secondary, and 3) neutral or leading. They refer to open questions as broad, allowing a fair amount of freedom in the kind of information elicited, and closed questions as being restrictive, calling for more specific responses. Primary questions are referred to as those that introduce new topics and secondary questions are those that strive to obtain additional information as a follow-up to a primary or secondary question. And finally, neutral questions allow the respondent to feel free from pressure to answer a question any particular way; whereas, leading questions imply that a certain response is expected.

V. Strategies for Pilot-testing and Evaluating Educational Products, with an Emphasis on Resource Trunks

In an effort to produce the most effective resource for teachers it is vital to first pilot the product and evaluate its effectiveness, before the next steps of implementation and dissemination. In a pilot study, the full research procedure is carried out, including analysis of the data collected, in close alignment to the planned

procedure for full implementation of the product (Borg and Gall, 1983). Pilot studies are done on a smaller scale, with fewer cases, than will be implemented in the final procedure; as few as two or three cases may be sufficient (Borg and Gall, 1983). There are many benefits to pilot studies, including revising measures and standards, assessing the appropriateness of components within the study, and providing additional knowledge that aids in improved research (Borg and Gall, 1983).

When The Einstein Project conducted studies to determine the effectiveness of their science kits, five classes were used in the experimental group and five classes were used in the control group (The Einstein Project, 2003). The groups used in the study were not chosen based on random selection, but rather on teacher training and experience. Evaluation of the success of the kits was measured by: a) standardized achievement tests, b) science achievement performance assessments, and c) assessment of critical thinking (inquiry) skills.

Evaluating educational products, especially in their pilot test phase, is a vital component to assessing whether they are meeting their predetermined objectives. As Richard Beswick (1990) states, "Program evaluation has long been a useful technical tool for determining if programs are meeting their stated goals." There are different categories of evaluation, two of which include formative and summative. B. W. Tuckman (1985) describes formative evaluation as an internal function that feeds results back into the program to improve an existing educational unit, and summative evaluation as existing for the purpose of demonstration and documentation. M. Scriven (1967) describes the function of the formative evaluation being to collect data about educational programs while they are still being developed, which can be used

by developers to “form” and modify the program; and describes the function of summative evaluation being to determine how worthwhile the final program is after the program has been fully developed.

In addition to the importance of the different functions of evaluation for the purpose of this study, information on criteria that can be used in the evaluation process was also beneficial. The following criteria were taken from, “Checklist For Evaluating Materials Designed Using Different Educational Media” (1996):

Do the materials to be evaluated:

- ❖ Offer clear guidance on how they can be used?
- ❖ Make their focus and relevance explicit?
- ❖ Take account the diversity of the learner backgrounds and learning styles?
- ❖ Take account of the learner’s prior knowledge and conceptions?
- ❖ Engage a variety of senses?
- ❖ Allow the learners to manage their own pace and pathway through the materials?
- ❖ Stimulate recall of earlier learning?
- ❖ Contextualize what is to be learnt?
- ❖ Offer the opportunity for dialogue between what is to be learnt and the learner’s conceptions of this?
- ❖ Provide a variety of examples?
- ❖ Provide opportunities for practice and application?
- ❖ Provoke reflection on what is being learned and on how it is being learned?
- ❖ Provide the opportunity for active learning?

- ❖ Provide feedback to the learner?
- ❖ Help learners to make their own connections, conclusions and contributions?
- ❖ Allow for group as well as individual use and learning?
- ❖ Enhance existing materials?
- ❖ Fit appropriately into the existing learning context?

As mentioned earlier, due to a lack of literature documenting how trunk programs are piloted and evaluated, it was necessary to obtain additional data directly from the trunk programs. Data related to these components of trunk programs can be found in Chapter Four.

VI. Chapter Summary

The field of environmental education grew out of several earlier movements, the instigating events of the 1972 United Nations Conference on the Human Environment, and the 1977 Tbilisi Conference on Environmental Education. There are several vehicles that can be utilized to attain the main goals of environmental education. Energy education is one vehicle. Investigating energy issues allows learners to become acquainted with a real-world environmental issue while also fostering a connection felt by the learners between themselves and the environment. They are able to increase their skills of evaluating an environmental issue. They see the importance of energy sources in our everyday lives and the need to explore various options to ensure their sustainability.

Within environmental education, and specifically energy education, there is a need for more hands-on, minds-on resources. Teachers feel that greater access to support materials will enhance their ability to teach their students energy related concepts.

Trunk programs are one method for potentially increasing the amount of hands-on, minds-on resources in the classroom. There is a dearth of literature documenting evidence of trunk program success in an educational setting. Research findings from two programs, The Einstein Project and the Holocaust Museum Houston Curriculum Trunk Program suggest success; however, greater documentation is needed. Therefore, the researcher obtained additional data via interviews of existing trunk programs, which can be found in Chapter Four.

There are several strategies for obtaining information on what is specifically needed by teachers in terms of energy related hands-on resources, as well as much other data. For the purpose of this study, the primary methods for obtaining the data were interviews and questionnaires.

After obtaining and compiling the necessary information and developing a product (in this case, a trunk), the next steps are to pilot and evaluate it. It is important to carry out these steps before the dissemination and implementation process, to determine what works effectively and what might need some improvement. A result of the pilot and evaluation is the adjustment of the product so that the most effective product is what will be disseminated in the final stage.

CHAPTER THREE

THE PROJECT METHODOLOGY

Overview

Between September 2000 and September 2001, the Wisconsin K-12 Energy Education Program conducted a nominal assessment project. Roughly one hundred K-12 teachers throughout the state participated in the project, intended to help strengthen the program and energy education. One of the most popular responses was a need for more materials and equipment to help teach about energy. In September of 2001 a graduate assistant position was created to develop an energy trunk.

The purpose of the trunk is to assist teachers in their efforts to teach about energy, by providing a “ready to go” resource filled with engaging and educational materials. The trunk is to be a resource that provides students with an opportunity to learn about energy via a hands-on approach, helping to draw the connection between energy and their lives.

This chapter describes the methods utilized to develop, evaluate, and disseminate the Energy Education Resource Trunk.

Statement of the Problem

The purpose of this study is to develop and evaluate an energy education resource trunk, and to recommend a strategy for its dissemination.

Subproblem One Methods

Subproblem 1. Are EE trunk programs effective in an educational setting, and what are the various components of an EE trunk program?

A list of trunk programs, and corresponding contact information, was compiled through an Internet search and discussion with environmental professionals, KEEP staff, KEEP Adjunct Faculty, and graduate committee members (Appendix B). A questionnaire was created to obtain the data needed, which included information on the effectiveness of the program and how the trunks were developed, evaluated, and disseminated (Appendix C). Because of the nature of the information needed, the questions were asked in an open-ended format, as opposed to yes/no or multiple choice. KEEP staff and graduate committee members reviewed the questionnaire to ensure its validity, and that the appropriate data would be obtained. In addition, because the study involved human subjects (the interviewees), the UW-Stevens Point Institutional Review Board had to review and approve a submitted copy of the questionnaire and protocol (Appendix D).

Due to a desire to obtain the most information from a limited number of trunk programs in a short time frame, the questionnaire was conducted via the telephone in

the form of an interview. Individuals, who were affiliated with the trunk programs, were initially contacted to be informed of the nature of the study and asked if they would participate in a brief interview focusing on their trunk program. Interviews were conducted and recorded with participant approval on a scheduled date and time. Eleven trunk/kit programs were interviewed and data from nine were used. Data from two programs were not extensive or applicable enough for meeting the objectives, and so were excluded.

Following the interviews, the data concerning the various components of each trunk program were compiled into spreadsheets. They were then reviewed and incorporated into subsequent development of the Energy Trunk.

In determining whether or not EE trunk programs were effective in an educational setting, further information was gathered from an additional number of trunk programs. These trunk programs were contacted either as a result of being referenced by formerly interviewed trunk programs, or through an Internet search. The purpose of contacting more programs was to obtain specific information on evidence of trunk program success in an educational setting. The trunk program coordinators were asked by the researcher if they believed their trunk program to be successful in an educational setting, and were asked to provide support through teacher and student quotes and other information. The data were obtained via telephone and email interviews.

Subproblem Two Methods

Subproblem 2. What resources should be included in the Energy Trunk?

Data obtained from several areas influenced the decision making process for which resources to include in the Energy Trunk. This data included: information obtained from trunk interviews, data concerning the appropriate grade level(s) of the trunk audience, chosen trunk themes and KEEP activities, the availability of resources, and feedback and review. Each area is discussed in greater detail below.

Trunk Interviews

Data obtained from the trunk/kit interviews (discussed in Subproblem 1 Methods) that were compiled in the Content spreadsheet were used to help guide which resources should be included in the Energy Trunk. Attention was given to the amount of hands-on resources, videos, posters, literature, and other items that were included.

Grade Level of Trunk Audience

In determining which grade levels the trunk should focus on, and thus which resources would be appropriate, a number of steps were taken. The first step was a focus group session with KEEP Adjunct Faculty at the Midwest Environmental Education Conference in October 2001 (Appendix E). One question asked at the session was which grade levels they believed should be the focus of the trunk.

The Adjunct Faculty were surveyed again by KEEP in the spring of 2002. This survey asked them to provide feedback on a few KEEP projects, including the Energy Trunk. The trunk section of the survey asked questions focusing on the trunk audience, KEEP activities to be included in the trunk, and teachers they knew of who might be interested in piloting the trunk (Appendix F).

In addition, Wisconsin academic standards were reviewed and further information was gathered from existing studies concerning teachers perceived energy education resource needs, which lent support to choosing the grade levels for the trunk audience.

Trunk Theme and KEEP Activities

Activities in the trunk were obtained in one of three ways. They were: (1) created, (2) discovered (see the following section: Availability of Resources), or (3) chosen from the KEEP Activity Guide.

The trunk theme(s) and KEEP activities were first chosen by KEEP staff and were then reviewed by KEEP Adjunct Faculty via the 2002 spring survey.

Availability of Resources

The data needed to meet this component of the objective included: 1) a list all materials needed to conduct the chosen KEEP activities and 2) a comprehensive list of available, general energy resources.

Lists of materials needed to conduct each of the KEEP activities were created from the materials section of each activity. Supplemental support resources for the activities were also added to each list.

The data needed to compile a list of general energy resources available were obtained through several means. KEEP staff and Adjunct Faculty were consulted because of their expertise in energy education. A short description of the project and a request for ideas on energy resources to include in the trunk was placed in the KEEP newsletter, *KEEP On Going*. An Internet search of various energy-related websites was conducted. In addition, approximately fifty educational catalogues were reviewed for potential energy resources.

After obtaining the data, it was compiled into an energy resource matrix with names of the energy resources, their sources, how much they cost, and the audience that they are suitable for, if known. After organizing the data, the resources were reviewed to assess which resources might be appropriate to support the chosen KEEP activities, or serve as additional resources to be included in the Energy Trunk.

Materials needed for the KEEP activities, as well as chosen items from the resource matrix, were then purchased from several sources.

Feedback and Review

Feedback from graduate committee members and KEEP staff and Adjunct Faculty aided in determining the audience of the trunk, and which KEEP activities and other resources to include in the trunk.

After the resources were gathered, they were organized in three different trunk containers. The trunk containers were chosen based on size, cost, availability, shipability, and aesthetics. Each of the three trunks was organized with labels and Rubbermaid, or similar, containers allowing them to be structured in a way that fostered easy use. KEEP staff, Adjunct Faculty, and graduate committee members reviewed the trunks before they were piloted.

Subproblem Three Methods

Subproblem 3. To what extent is the Energy Trunk effective?

Background

Data related to the pilot and evaluation phases of existing trunk programs had to be obtained before an evaluation plan could be created and implemented for the Energy Trunk. This data was obtained via the trunk program questionnaire discussed earlier in Subproblem One Methods.

Following the literature review and trunk program interviews, it was determined that for the purpose of this project, a pilot study would be conducted, to include an assessment of the trunk's value as a teaching tool, and ability to positively impact student energy awareness and knowledge gain, and attitude change.

Research Design

A Nonrandomized Control Group Pretest-Posttest design was used for this study. Quantitative data was obtained from students in both the experimental and control groups, to determine the effect of the Energy Trunk. Student pre/posttests served as the tool for assessing student energy awareness, knowledge, and related attitude and behavior. It contained identical items in the pretest and the posttest for both the experimental and control groups. All students were given a pretest and then approximately two to three weeks later they were given a posttest (Appendix K).

In addition to obtaining quantitative data from the student pre/posttests in the experimental and control groups, data were also obtained from students in the experimental group, who had exposure to the Energy Trunk, using a questionnaire (Appendix M).

Quantitative data were also obtained, via a questionnaire, from the teachers in the experimental group, concerning the trunk serving as a useful teaching tool (Appendix H).

Instrument for Teachers

Samples of teacher evaluations were obtained from interviewed trunk programs. This was beneficial because, although the trunks have different focuses, they have the similar goal of assessing the product as a valuable teaching tool for teachers. The researcher created some questions for the Energy Trunk Teacher Evaluation. Additionally, other questions were added that had been adapted from the sample evaluations (Appendix G). KEEP staff and graduate committee members

reviewed it to ensure validity. More revisions were made to create the final version (Appendix H). The teacher evaluations were organized in packets with student materials and a letter from the researcher. Each packet was shipped with one trunk, to its respective teacher in October 2002.

Instruments for Students

The instrument used for the student pre and posttests was a fifteen-item questionnaire. The researcher created nine multiple-choice items and borrowed one item from the *K-12 Energy Education Program Baseline Study*, 1999. These ten items were mostly based on the concepts covered in the five KEEP activities, included in the trunk. These items helped to determine student energy awareness and knowledge gain. In addition, five items were asked on a Likert-type scale to assess change in student attitude and behavior towards energy and energy conservation where: A = Strongly Agree, B = Agree, C = Undecided, D = Disagree, E = Strongly Disagree. Some of these items were borrowed again from the *Baseline Study*, as well as from *The Development of an Instrument to Assess the Environmental Literacy of Fifth Grade Students in Wisconsin* (Quale, 1993).

Subsequent to creation of the pre/posttest, KEEP staff and graduate committee members reviewed it for validity purposes. After corresponding edits were made, KEEP Adjunct Faculty members reviewed it at the annual meeting held in August 2002 (Appendix I). Adjunct Faculty served as a Validity Panel for the ten content questions at the August meeting. They were each given an Evaluation Packet and asked to review the items according to 1) Content Validity, 2) Readability, 3)

Accuracy, and 4) Distracters. Additional comments about the items were also requested (Appendix J). The Evaluation Packet was based on that which was used in *The Development of an Instrument to Assess Environmental Literacy of Eleventh Grade Students in Wisconsin* (Peri, 1996). Following this evaluation, additional edits were made to ensure that the instrument would appropriately address concepts covered in the trunk and that they met the evaluation criteria in the evaluation packet. Following this step, the Adjunct Faculty were sent the five attitudinal and behavioral items along with the revised instrument containing the ten content questions. Comments were sent back to the researcher and a final instrument was created to serve as the pre/posttest (Appendix K).

A second instrument, a four-item questionnaire, was created to aid in determining the effectiveness of the Energy Trunk, from the students' perspective. Questions were asked of the students regarding their overall thoughts about the Energy Trunk, what activities or items they liked most, what activities or items they liked least, and three things that they learned. The researcher adapted this questionnaire from an interviewed trunk program (Appendix L). After the Energy Trunk Student Evaluation questionnaire was created, KEEP staff and graduate committee members reviewed it and minor edits were made (Appendix M).

Sample

The sample of class participants was attained by first identifying, with assistance from KEEP staff and Adjunct Faculty, a list of KEEP teachers (Wisconsin teachers who have participated in the KEEP graduate level course) who teach fifth

through eighth grade, and who may have been interested in piloting the trunk. It was decided that for the purpose of this project, only KEEP teachers would be permitted to pilot the trunk and serve as teachers conducting the control group portion of the pilot. Working with only KEEP teachers ensured some consistency in the pilot study.

The researcher contacted the referenced teachers, explained the project and asked if they would be interested in participating in the pilot. Eight fifth through eighth grade KEEP teachers, two per grade, agreed to serve as part of the experimental group and conduct a full pilot of the energy trunk. Conducting the full pilot, and being in the experimental group, consisted of teachers spending about three weeks administering a pretest to assess student awareness of, knowledge of, and attitude towards energy; conducting all of the Energy Trunk activities; administering a posttest (identical to pretest); leading the students in filling out trunk evaluation forms; and completing a trunk evaluation form themselves. As an incentive, these teachers were offered a stipend of \$200 for their time. The KEEP teachers and respective classes in the experimental group consisted of the following: 2 fifth grade elementary, 2 sixth grade science, 2 seventh grade science, 1 eighth grade technology education, and 1 eighth grade agriculture. The eight classes making up the experimental group had a sample size of 173 students and 8 teachers.

Eight fifth through eighth grade KEEP teachers agreed to have their class serve as part of the control group of the pilot study. They administered a pre and posttest to their students, who did not have exposure to the Energy Trunk. These teachers were offered a stipend of \$50 for their time, and the opportunity to use the Energy Trunk at no expense in the future. The KEEP teachers and respective classes

in this control group consisted of the following: 2 fifth grade elementary, 2 sixth grade science, 2 seventh grade science, 1 eighth grade math, and 1 eighth grade technology education. The eight classes making up the control group had a sample size of 167 students and 8 teachers.

Procedure

Prior to the pilot, in September 2002, the researcher submitted a protocol to be reviewed by the University of Wisconsin – Stevens Point Institutional Review Board (IRB) (Appendix N). Part of the approved protocol required written consent from all teachers involved in the pilot. In addition, written consent was required from District Administrators where the Energy Trunk was to be piloted. Parental consent was waived due to the fact that components of the study, most notably the pre/posttest, were not unlike what students do on a normal basis in a classroom setting. All participants were informed that they could remain anonymous on the trunk evaluation forms. Students were asked to write their first name and last initial on the pre/posttest. However, they remain anonymous in all discussion of results of the pilot.

Teachers were sent their respective materials (either just pre/posttests or pre/posttests, evaluation forms, and an Energy Trunk) in the first week of October 2002. October is Energy Awareness month, and thus an appropriate time to conduct a study with an energy focus.

Teachers were given clear explanations, via phone, email and hard copy letters, regarding the format of the pilot study and instructions that should be given to their students (Appendix O). Teachers in the experimental group were asked to

administer the pretest, conduct all of the activities in the trunk, administer the posttest, hand out the student evaluation forms for the trunk, and complete a teacher evaluation for the trunk.

An Energy Education Trunk Guide was also created by the researcher to aid the experimental group teachers in conducting the trunk activities. A Guide accompanied each trunk.

All pilot materials were sent back to the researcher by the second week of November 2003, at which time data analysis began.

Pre/posttest: Data Analysis

Student responses to the pre and posttests were recorded on scantron answer sheets. Data from the tests were imported into SPSS. Within SPSS, each student response was recoded so that for items 1-10 (Awareness/Knowledge), all correct responses received a value of "1" and all incorrect responses received a value of "0." For items 11-15 (Attitude/Behavior), Likert-type responses were recoded on a scale, where the most favorable response (e.g. a more positive response with respect to energy conservation) received a value of "5" and the least favorable response received a value of "1." Subsequent to this step, sum scores for knowledge and attitude were obtained for each student in the experimental and control groups. The two groups were identifiable by a column that held a "1" if the student had exposure to the trunk and a "0" if s/he did not have exposure to the trunk. Pre and posttest sum scores were also identifiable for each student by a column that denoted the pretest a code of "1" and the posttest, a code of "2." Next, two new variables were introduced

to reflect a knowledge gain score and an attitude gain score. The knowledge gain score was equivalent to the posttest knowledge score minus the pretest knowledge score, for each of the groups. The attitude gain score was equivalent to the posttest attitude score minus the pretest attitude score. With these two new variables an independent-measures t-test could be run for the entire group. The test variables were the knowledge gain score and attitude gain score, and the grouping variable was whether it was in the experimental or control group. This test was chosen because it enabled the researcher to determine whether there was a significant difference in gain scores for the experimental and control groups.

Leedy (1993) suggests that in a Nonrandomized Control Group Pretest-Posttest design, comparing pretest results will indicate the degree of equivalency between experimental and control groups. This is not necessary because gain scores, and not posttest scores, are used to determine significance between the experimental and control groups.

Trunk Questionnaires: Data Analysis

Data from the experimental group's evaluation of the Energy Trunk was also analyzed quantitatively.

Questions were asked of the students regarding their overall thoughts about the Energy Trunk, what activities or items they liked most, what activities or items they liked least, and three things that they learned. Data concerning their overall thoughts about the trunk was summarized based on similar response, by grade, and then compiled into interpretive graphs. Data related to students' most and least

favorite activities or items in the trunk was also summarized based on similar response, by grade. However, due to the high number of categories of student responses, tables were used instead of graphs to display the data. Student responses to the last question/request, "Please describe three things that you learned from the Energy Trunk," was not categorized because of the extremely high variety of responses.

Data from the teacher evaluations was also analyzed. The first eight items were asked on a Likert-type scale. Responses to these items were quantitatively summarized and compiled into graphs. Items nine through sixteen were quantitatively summarized and categorized in a similar fashion to the student evaluation responses. Categories of similar responses were made and corresponding interpretive graphs and tables were created.

Subproblem Four Methods

Subproblem 4. What is the best strategy for disseminating the Energy Trunks?

The initial step in determining an effective method of dissemination for the Energy Trunks was to gather information from existing EE trunk programs through the questionnaire discussed in Subproblem One Methods. The relevant information concerned the dissemination strategies the trunk programs have used, and how effective they have been. After gathering this information a decision was made as to how to disseminate the trunks for the project pilot in October 2002.

Information gathered from the dissemination strategy used in the pilot, as well as from the other trunk program dissemination strategies, influenced the final dissemination strategy recommended for the Energy Trunks. Factors considered in determining a final dissemination strategy included the following: ease of shipping the trunks out and receiving them back; condition of the trunks and accompanying resources when they were returned; maintenance/time requirements; logistical and budget concerns; teacher needs; recommendations from trunk programs; and more.

CHAPTER FOUR

RESULTS OF THE STUDY

Subproblem One Results

Subproblem 1. Are EE trunk programs effective in an educational setting, and what are the various components of an EE trunk program?

Trunk Program Effectiveness

A lack of literature documenting the effectiveness of trunk programs in an educational setting resulted in the need to conduct interviews with existing trunk programs. Several trunk programs were interviewed, and quotes attesting to the effectiveness of their trunk in an educational setting were obtained from trunk program coordinators, as well as from teachers/leaders and students who have used the trunks. The following data is grouped according to each individual organization who administers a trunk program(s).

Assateague Island National Seashore

According to Liz Davis (2002), Assateague Island National Seashore has a “Beach in a Box” traveling trunk that is loaned out to teachers, nature centers, etc. Davis has obtained the following quotes from students and formal and non-formal educators via trunk evaluation forms. The quotes exhibit the success of their trunk program in an educational setting.

- ❖ “Thank you for sending the trunk. My favorite things in the trunk were the horseshoe crabs. I liked it because you could see the under part of it. Horseshoe crabs look like giant spiders from the underneath of it.”- *Grade 4 student*
- ❖ “We hope you can send it back next year so the other fourth grade can look at the things in the chest. I think they will enjoy it just like we did”- *Grade 4 student*
- ❖ “We enjoyed exploring oceans and beaches with your wonderful traveling trunk! We used the trunk for three nature camps and a two hour general program. We set up our different activities as six learning stations. This was very effective and the children could explore at their own pace”- *Nature Center Camp Coordinator*
- ❖ “...This trunk is a wonderful idea and such a great ‘hands-on’ teaching tool. I would love to be on the mailing list for this again”- *Elementary teacher*
- ❖ “My class explored the contents...and just loved the ‘hands-on’ experience of the park without ever leaving our classroom”- *Elementary teacher*

Science Museum of Minnesota

James Heintzman of the Science Museum of Minnesota coordinates a trunk program that has eleven different types of trunks, including ones that focus on Bears, Dinosaurs, Frogs, and Water. Heintzman (2002) wrote, “From the beginning of our Museum Trunk program over 14 years ago, teachers have consistently listed the ‘real objects’ as the most useful resources in our trunks, regardless of the topic. They also comment frequently on how much value their students place upon the objects. I am convinced students and teachers are starved for three-dimensional and four-dimensional experiences – things that are often hard to find in a classroom.”

Offshore Energy Center

Sometime ago, Misty Yarotsky taught fourth grade and used a traveling trunk called the Boy in the Alamo. Yarotsky (2002) said, “[the trunk] followed a literature book with the same title and the trunk was supposed to be a suitcase packed by the ‘boy.’ The students were extremely interested from the day it arrived until the day it left. The world of pretend is so valuable to the young mind’s ability to learn. The hands-on contents provided needed tangible connections from the past. As a teacher, I felt the students appreciated the whole Alamo story much more than in previous years.”

Yarotsky currently is the Education Director for the Offshore Energy Center and she administers a traveling trunk called the Knowledge Box. It is dedicated to expanding the knowledge and perception of the petroleum industry, and is geared for an 8th – 12th grade audience. Yarotsky (2002) reported that on teacher evaluations a common comment is “Thanks, this helps me understand more so I do a better job teaching.” She also commented on some general thoughts on what helps to make a trunk program successful. She writes, “I do believe it is directly related to the teacher.” And so she suggests a training program be set up in conjunction with leasing out trunks. This, she believes, helps teachers become more comfortable using the trunks and asking questions if necessary. Yarotsky also stated that trunk program success in an educational setting is related to the need— if the topic of the trunk is lacking in current curriculum and/or if teachers feel uncomfortable teaching the subject matter, then there is a strong possibility that the trunk will be a useful teaching tool. One last comment made by Yarotsky is that making it as easy as possible for the

teachers makes a program successful. Teachers often feel overwhelmed by how much they need to do, so by taking care of things like arranging for delivery and pick-up ensures greater success. Many trunk programs do address this issue and, for example, coordinate all of the shipping to and from the school, or other, site.

University of Mississippi Museums

Chandra Williams is the Museum Educator for the University of Mississippi Museums. When the researcher asked if she was aware of any documentation discussing the success of trunk programs in an educational setting Williams (2002) responded, "I do not know of any, but I know they are successful." As Museum Educator, Williams coordinates a traveling trunk program that encompasses trunk topic areas including Rocks, Shells, the Mississippi River, Human Anatomy, Insects, Presidents, 19th Century Life, the Civil War, Space Science, and many more.

Jefferson National Expansion Memorial

Diane Weber (2002) of the Jefferson National Expansion Memorial in St. Louis, Missouri, displays the success of her trunk program through some statistics for fiscal year 2002. In that year, they had 115 bookings (up 10 from fiscal year 2001). There were a total of 352 schools and other groups who had contact with the trunks. Requests come from schools, libraries, scout groups, home schools, and more. In addition, they are often asked to exhibit at workshops, conferences, and other special events. Their trunk themes include: Lewis and Clark Expedition, Cowboy, African Americans of the West, Frontier Classroom, Goldminers, Heritage of the Southwest,

A City of Immigrants, Mountain Man, Overlanders, and Plains Indians. The following quotes are taken from teacher/leader evaluations:

- ❖ “What a great bargain! My students especially enjoyed the toys and clothing”
- ❖ “Overall, I loved the trunks! I only wish my class had them for more time.”

Nature Center of Fort Missoula

Some traveling trunks and kits have gained recognition beyond just positive feedback from teachers and non-formal educators. The Nature Center at Fort Missoula has several different trunks. One of them, the Songbird Blues Kit, won the International award for public awareness education from the Partners in Flight program (The Nature Center – Montana Natural History Center, 2002).

The Einstein Project

The Einstein Project has also received recognition for their program. In 1997, it was featured as a national model for a successful science program in the book, *Science For All Children*. As mentioned in Chapter Two, section three, The Einstein Project leases hands-on science units as kits to schools for eight weeks. Their 1999 Cornerstone Study displayed many positive results for students who used the kits versus students who did not use the kits (The Einstein Project, 2003).

Because traveling trunks, like Einstein kits, tend to be more hands-on in nature than traditional textbook based teaching, a general assumption may be made that traveling trunks, like the Einstein kits, are successful teaching tools. This, in

addition to evidence of success of the Holocaust Trunk and the vast amount of support seen above from EE trunk programs, teachers, other program leaders, and students, assert confidently that trunk programs are successful in an educational setting for helping to both better engage students in the learning process and support teachers in their efforts to teach effectively.

Components of Trunk Programs

Data concerning the various components of each trunk or kit program interviewed were compiled into eight spreadsheets. The spreadsheets correspond to eight areas of focus for each trunk or kit program, and include:

- ❖ Physical nature of the trunk or kit
- ❖ Contents
- ❖ Budget
- ❖ Piloting
- ❖ Evaluation
- ❖ Dissemination
- ❖ Maintenance
- ❖ Other—Advice, etc.

The eight spreadsheets can be viewed in Appendix P.

Subproblem Two Results

Subproblem 2. What resources should be included in the Energy Trunk?

Prior to choosing items for inclusion in the Energy Trunk, results had to be gathered based on EE trunk interviews, the determined Energy Trunk audience and themes/activities, and the availability of resources. These background results influenced which resources were chosen for the Energy Trunk and are discussed below. They are followed by the results of which resources were included in the Energy Trunk.

Trunk Interviews

Review of the responses from the trunk/kit interviews showed that resources that were more popular with students were ones that were more hands-on in nature. Individuals borrowing the kits liked to have unique or “weird” items, but also some that were fairly common as well. Items that were visual and relevant to kids were much more popular than printed educational materials. It was also found that teachers like to have multimedia resources to use in their classroom. Most trunk users used videos frequently. Another finding of the trunk interviews was that they seem to be more often used by a middle school audience. These findings greatly influenced the resources that were chosen for the energy trunk.

Trunk Audience: 5th – 8th grade

When KEEP Adjunct Faculty were asked which grade levels they believed should be the focus of the trunk at the Midwest Environmental Education Conference in October 2001, the majority responded that the trunk should focus on a fifth through eighth grade audience. This response was based on their experience with teachers and knowledge of what resources are available. They also felt that the fifth through eighth grade range was a good choice because of its adaptability for both younger and older audiences.

When the Adjunct Faculty were surveyed again by KEEP in the spring of 2002, they were asked to provide feedback on a few KEEP projects, including the Energy Trunk. The trunk section of the survey asked questions focusing on the trunk audience, KEEP activities to be included in the trunk, and teachers they knew of who might be interested in piloting the trunk. The vast majority of Adjunct Faculty respondents reiterated their agreement that the trunk should focus on a fifth through eighth grade audience.

Further support for choosing a fifth through eighth grade audience can be seen in findings from *Wisconsin K-12 Teachers' Perceived Environmental Education Resource Needs* which concluded that energy issues are unique to middle school teachers' top priorities (Dixon, 2001).

In addition, Wisconsin science standards were reviewed and several standards that should be met by grade eight were found to fit well within the themes and activities of the trunk (Appendix Q).

Trunk Theme and KEEP Activities

Providing students with an energy “story,” taking them from an understanding of energy sources to energy forms and conversions to how we use energy to how we can use energy efficiently, was chosen as the overarching theme of the Energy Trunk.

Activities chosen from the KEEP Activity Guide and approved by KEEP Adjunct Faculty were chosen with this theme in mind. The KEEP activities included in the trunk are: *Station Break*, *Circuit Circus*, *At Watt Rate*, *Cost of Using Energy*, and *Diminishing Returns* (Appendix T).

Availability of Resources

A comprehensive list of available, general energy resources was secured in a resource matrix and can be viewed in Appendix R.

Resources Included in the Energy Trunk

Resources that were chosen to be included in the trunk are listed below in Figure 4.1. This list was greatly influenced by the results discussed above. Sources and costs for these items can be found in Appendix S.

Figure 4.1: Energy Trunk Contents

Energy Samples
Coal packets (peat, lignite, bituminous, anthracite)
Oil
Simulated nuclear fuel pellet
Wind pinwheel
Photocell kit (kit contains paper directions, 1 photocell, 2 wire connectors with alligator clips, 1 motor, 1 propeller, 1 buzzer, 1 mini light bulb, and 1 mini light bulb socket)

Videos
Bill Nye the Science Guy: Energy
Bill Nye the Science Guy: Electrical Current
Simple Things You Can Do To Save Energy In Your School
Our Fragile Earth: Energy Efficiency and Renewables
CD Rom
Energy & Environmental Issues
Posters
Fueling the Future
Energy Management In and Around Your School
Renewable Energy Sources
Books/Booklets
Energy Education Resources
Energy Saver's Guide
Energy Glossary
Station Break Activity materials
Ball
Flashlight
10 Rubber bands of various thickness
Stopwatch
7 laminated station break cards
Radiometer
Hair dryer
Paper fan
Battery operated object #1 (toy)
Battery operated object #2 (toy or other)
3 wind-up or pull back toys
2 party noisemakers
Kazoo
Sleigh bell shaker
1 wooden instrument with 1 wooden tapper
Maraca or fruit shaker
Circuit Circus Activity materials
12 laminated "E" squares
3 laminated "I am a battery" signs
1 laminated "I am a light bulb" sign
1 16' long piece of string
5 Electricity Discovery Kits (each with a double battery holder, 2 switches, 2 - bulb holders, 2 bulbs, 5 wire connectors with alligator clips, and 2 D batteries

4 flashing smiley balls
Overhead transparency: <i>Diagram of a Series Circuit and Diagrams of Parallel Circuits</i>
The Cost of Using Energy Activity materials
75 watt incandescent light bulb
20 watt compact fluorescent light bulb
At Watt Rate Activity materials
Overhead transparency: <i>Annual Energy Expenses for a typical Wisconsin household</i>
Overhead transparency: <i>U.S. Electricity Consumption by End Use, 1993</i>
Watt meter
Diminishing Returns Activity materials
2 bulbs from Cost of Using Energy Activity
Overheads: <i>Comparison of Efficiencies</i>
Overhead: <i>Calculating System Efficiencies</i>
Overhead: <i>Steps of the Relay Simulating Energy Conversion Process</i>
Overhead: <i>Converting Chemical Energy to Light Energy</i>
Overhead: <i>Converting Chemical Energy to Light Energy</i>
3 plastic containers with 1 hole in bottom
3 plastic containers with holes covering 1/3 of the bottom
18 small paper cups

An Energy Education Trunk Guide was also created by the researcher to aid the experimental group teachers in conducting the trunk activities. The guide accompanied the trunk, and has several components (Appendix T). It includes a(n):

- ❖ Letter to the teacher
- ❖ Suggested Sequence of Activities
- ❖ Reminders sheet
- ❖ Copy of the KEEP activities: *Station Break, Circuit Circus, At Watt Rate? Cost of Using Energy, and Diminishing Returns*
- ❖ Set of laminated Station Break cards
- ❖ Set of overheads for the KEEP activities

- ❖ Set of the backs of the trunk's posters, for additional energy activities
- ❖ Watts Up? Teacher's Guide and Student Workbook
- ❖ Set of laminated signs for the Circuit Circus activity
- ❖ Energy Trunk Checklist

Photographs of the three trunk containers chosen, based on size, cost, availability, "shipability", aesthetics, etc. can be viewed in Figures 4.2 – 4.4 below.

Figure 4.2: Trunk A

Cost estimate: \$60.00

Source of purchase: Menards

Dimensions: 20.75" x 36" x 13.5"

Special features: handle, wheels, lock, and internal compartments (aids in organization)

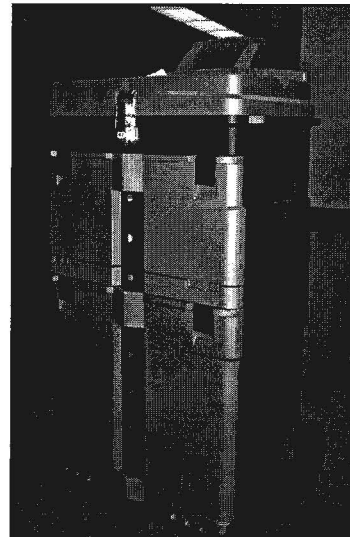


Figure 4.3: Trunk B

Cost estimate: \$25.00

Source of purchase: Shopko

Dimensions: 16" x 30" x 12.5"

Special features: low cost, locks, durable, nice look

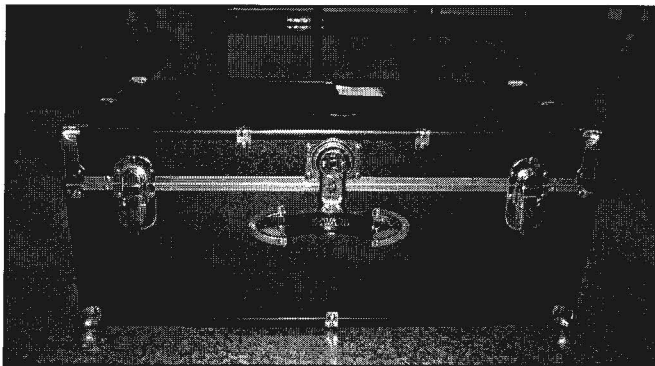


Figure 4.4: Trunk C

Cost estimate: \$250.00

Source of purchase: Downing Displays

Dimensions: 36" x 18" x 8"

Special features: very durable & easy to transport; has wheels & handles



Subproblem Three Results

Subproblem 3. To what extent is the Energy Trunk effective?

Results of how other trunk programs pilot and evaluate their trunks had to be collected before results could be obtained concerning the effectiveness of the Energy Trunk. These background results concerning how trunk programs pilot and evaluate their trunks are discussed below, followed by the results of the evaluation of the Energy Trunk's effectiveness.

Background Results: Piloting Trunks

Due to a lack of documentation concerning piloting and evaluating trunk programs, it was necessary to first gather additional data directly from existing trunk programs, before evaluating the effectiveness of the Energy Trunk. It was found that a limited number of trunk or kit programs, interviewed by the researcher, conducted or had access to information regarding a pilot study of their trunk program (Appendix P). Some information obtained included one program that had a partnership with a magnet school in the area. When a new trunk was developed, the magnet school would pilot it and the teacher(s) and students would give feedback. Another program contacted by the researcher piloted their three trunks in twelve schools. These examples show the range in the number of groups used in a pilot study. Therefore, it appeared that there is not a predetermined number that is right for every pilot study. Rather, each program must determine their needs and desired outcomes and choose

the appropriate number, taking into account related research, considerations, and constraints.

Background Results: Evaluating Trunks

Many trunk programs interviewed by the researcher may not have done in depth pilot studies, but almost all do conduct ongoing evaluation as their trunks are loaned or sold to teachers/leaders. The most common form of evaluation is a questionnaire filled out by the teacher at the end of the loan period (Appendix G). This evaluation form accompanies the traveling trunk and may ask questions in a yes/no format or on a Likert-type scale, teachers (or other) are asked to circle a number corresponding to a scale of strongly agree to strongly disagree in response to a statement such as: "The materials in the trunk are easy to pack, unpack, and use"; and "The trunk and lesson plans were helpful in teaching my class." Questions on the evaluation form may also be asked in an open-ended format such as: "Did your students enjoy using the trunk?"; "Which activities were most effective and which were least effective?"; "Did the trunk help to support you in your teaching?"; "Was the trunk suitable for the grade level you used it with?"

Only one trunk program interviewed, Assateague National Seashore's "Beach in a Box" (aimed at a first through fourth grade audience), evaluates their trunk program also from the students' perspective (Daignealt, 2002). They do this, like the teacher evaluation, through qualitative techniques in the form of a short open-ended evaluation form. Examples of questions asked are: "What did you think of this trunk?"; "Was the trunk fun?"; "What activities did you do?"; and "What did you like

the best and the least?” The evaluation also asked students to describe three things that they learned from the trunk. For more information on the evaluation component of trunk programs, please see Appendix P.

None of the trunk programs interviewed conducted a quantitative analysis on students learning prior to and after exposure to the trunks. The Einstein Project, through their Cornerstone Effectiveness study, and the Holocaust Museum Houston Curriculum Trunk Program did perform quantitative analysis, as seen earlier in chapter two, section three.

Using various tools for evaluation purposes, such as questionnaires as used in all trunk programs interviewed, and student pre and posttests as used by The Einstein Project and Holocaust Museum Houston Curriculum Trunk Program, appears to allow for a deeper level of evaluation. And thus, both techniques were used when assessing the effectiveness of the Energy Trunk.

Energy Trunk Effectiveness Results

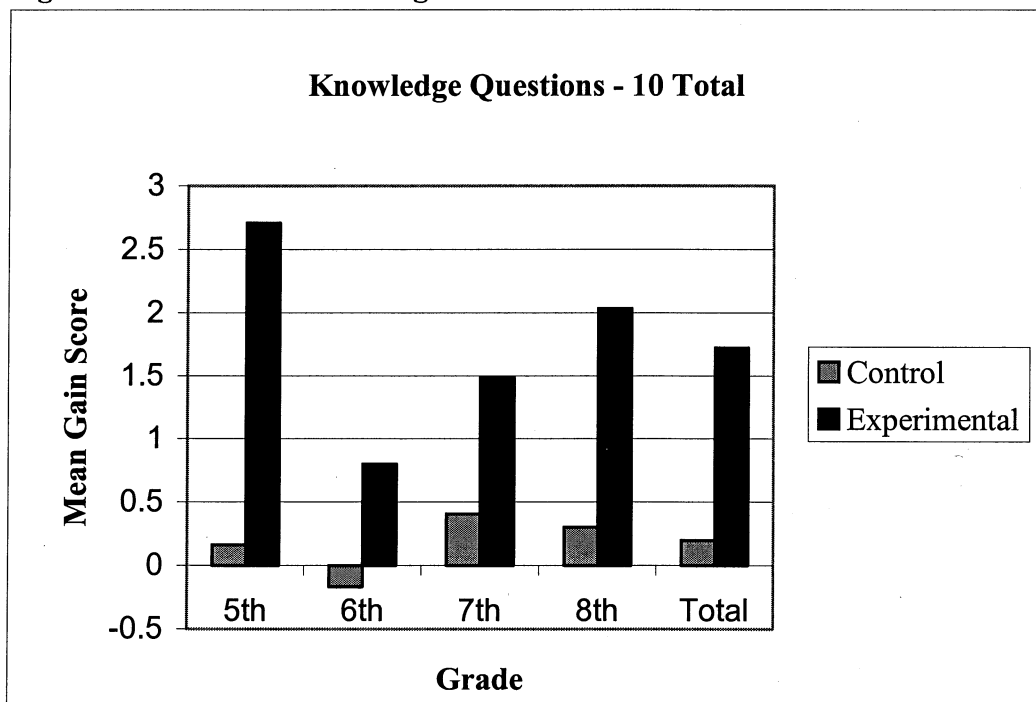
Student Pre and Posttests

An independent-measures t-test was used to assess the impact of the use of the Energy Trunk on student energy knowledge and attitudes using a quantitative measurement tool.

The results of independent measures t-test indicated that the group who had exposure to the Energy Trunk ($M = 1.72$, $SD = 2.15$) increased their energy knowledge more than the group who did not have exposure to the trunk ($M = .198$, $SD = 1.54$). This difference is significant, $t(327) = -7.414$, $p < .001$, two-tailed. These

results are presented in Figure 4.5, where “mean gain score” represents the average number of additional knowledge-based questions answered correctly on the posttest compared to the pretest. For example, fifth graders in the experimental group improved from the pretest to the posttest with an average gain of 2.7 more questions answered correctly, out of a total of 10 knowledge-based questions.

Figure 4.5: Student Knowledge Mean Gain Scores

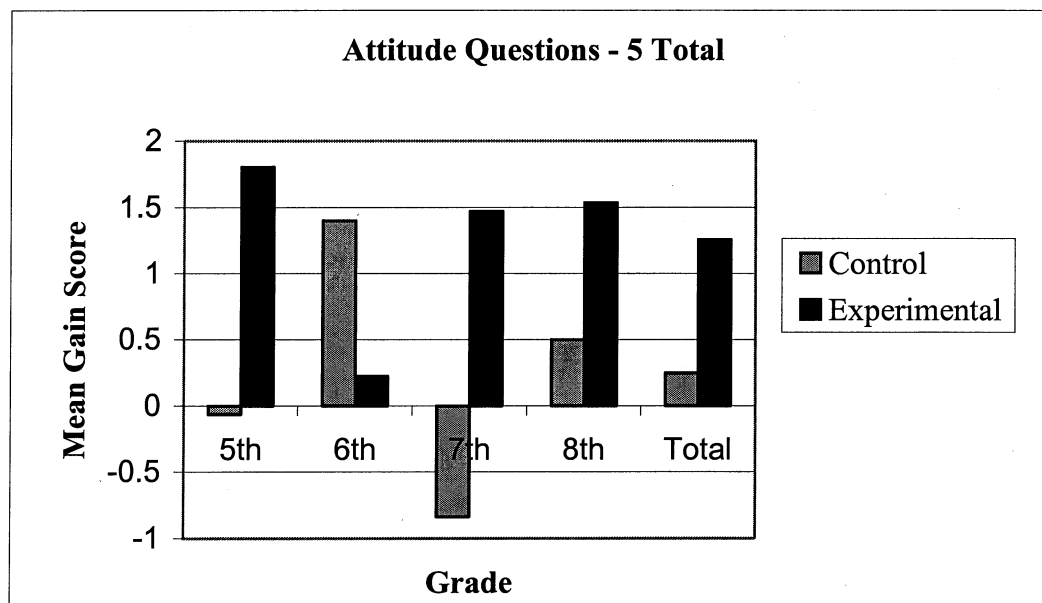


As illustrated in Figure 4.5, knowledge mean gain scores differ between the control and experimental groups at the grade specific level. The knowledge mean gain scores for the control and experimental groups for 5th grade are 0.1633 and 2.7073 respectively. The 6th grade scores are -0.1667 and 0.8, the 7th grade scores are 0.4063 and 1.4906, and the 8th grade scores are 0.3036 and 2.0357 respectively. The

total knowledge mean gain score is 0.1976 for the control group and 1.722 for the experimental group.

In addition to the significant difference in knowledge mean gain scores, results also indicate the group who had exposure to the trunk ($M = 1.26$, $SD = 3.16$) had a greater increase in a positive attitude toward energy conservation than the group who did not have exposure to the trunk ($M = .25$, $SD = 3.06$). This difference was significant, $t(323) = -2.918$, $p < .01$, two-tailed. These results are presented in Figure 4.6, where “mean gain score” represents the change in the number of more favorable responses with respect to energy conservation, from the pretest to the posttest. For example, fifth grade students in the experimental group responded more favorably to about 1.8 attitude/behavioral-based questions, out of a total of 5, on the posttest compared to the pretest.

Figure 4.6: Student Attitude Mean Gain Scores



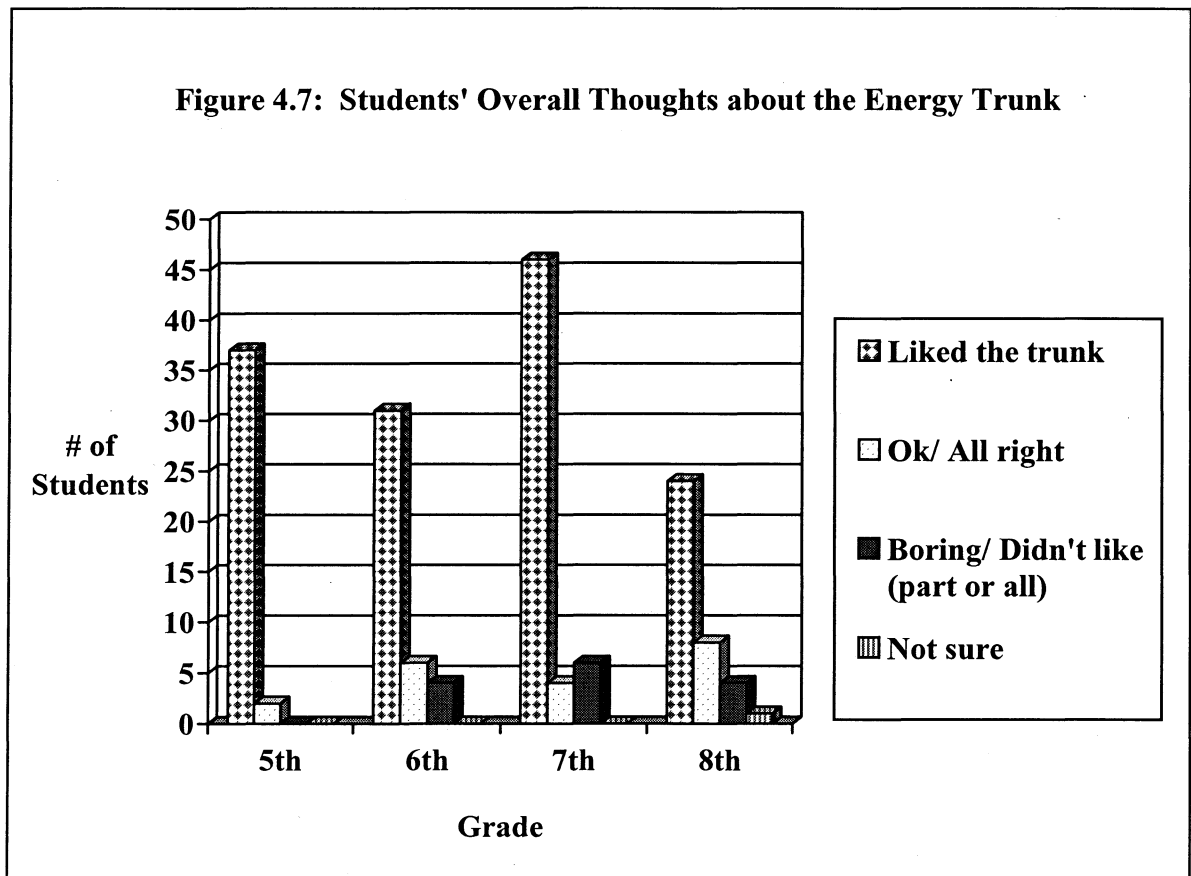
As illustrated in Figure 4.6, attitude mean gain scores also differ between the control and experimental groups at the grade specific level. The attitude mean gain scores for the control and experimental groups for 5th grade are -0.0625 and 1.8049 respectively. The 6th grade scores are 1.4 and 0.225 , the 7th grade scores are -0.8387 and 1.4706 , and the 8th grade scores are 0.5 and 1.5357 respectively. The total attitude mean gain score is 0.2485 for the control group and 1.2562 for the experimental group.

The quantitative results suggest that the Energy Trunk had a significant impact on students' knowledge of and attitude towards energy.

Student Trunk Evaluation

Students in the experimental group responded to an open-ended questionnaire that served as a student trunk evaluation form.

Responses to item 1, "Overall what did you think about the Energy Trunk?" have been quantitatively summarized in Figure 4.7 where the number of students is along the y-axis and the grade is along the x-axis. Student responses can be summarized under four broad categories with respect to their overall feelings about the trunk: 1) Liked it; 2) Ok/ all right; 3) Boring/ didn't like the trunk (part or all); or 4) Not sure.



Figures 4.8 through 4.11 provide examples of student responses that fall under the four categories summarized in Figure 4.7.

Figure 4.8: Examples of 5th grade responses to overall thoughts about trunk

Category of Response	5 th Grade Example Responses
1. Liked the trunk	<ul style="list-style-type: none"> ▪ “It was very COOL!– p.s. I mean it!” ▪ “It was very cool. I think you should give it to another class. I loved the videos” ▪ “I think it was a good way to learn” ▪ “Trunk is cool looking and has awesome activities” ▪ “I thought overall it was fun and interesting”
2. Ok/ All right	<ul style="list-style-type: none"> ▪ “It was all right” ▪ “I thought it was okay”
3. Boring/ Didn’t like (part or all)	N/A
4. Not Sure	N/A

Figure 4.9: Examples of 6th grade responses to overall thoughts about trunk

Category of Response	6 th Grade Example Responses
1. Liked the trunk	<ul style="list-style-type: none"> ▪ “Learning about energy is awesome because I like learning how to save energy” ▪ “I liked it a lot. The activities were very fun and explained it great” ▪ “I thought it was the best unit” ▪ “...very awesome and it also helped me learn how many different types of energy there really are” ▪ “I thought there was alot of fun experiments and I learned a lot about energy”
2. Ok/ All right	<ul style="list-style-type: none"> ▪ “Okay but not going to be my favorite thing in science” ▪ “It was an ok unit not the funnest I have had”
3. Boring/ Didn’t like (part or all)	<ul style="list-style-type: none"> ▪ “I thought most of it was review and I didn’t really like it” ▪ “I didn’t like because I hate science”
4. Not Sure	N/A

Figure 4.10: Examples of 7th grade responses to overall thoughts about trunk

Category of Response	7 th Grade Example Responses
1. Liked the trunk	<ul style="list-style-type: none"> ▪ “An awesome experience” ▪ “Was the coolest– if they were for sale I would buy one” ▪ “Fun and educational– we got to do hands-on things” ▪ “Neat because of everything that was in it” ▪ “Helps us understand science more”
2. Ok/ All right	<ul style="list-style-type: none"> ▪ “I thought it was ok, but I am not thrilled with energy and science” ▪ “It was ok but some things were weird.”
3. Boring/ Didn’t like (part or all)	<ul style="list-style-type: none"> ▪ “Not too bad but some was boring” ▪ “I thought it wasn’t too bad, but some of the stuff was boring”
4. Not Sure	N/A

Figure 4.11: Examples of 8th grade responses to overall thoughts about trunk

Category of Response	8 th Grade Example Responses
1. Liked the trunk	<ul style="list-style-type: none"> ▪ “I thought it was fun because it showed how electricity works” ▪ “It’s great!” ▪ “I never realized how many activities there are that have to do with energy” ▪ “I liked the hands-on activities...” ▪ “The energy trunk was informative about energy issues”
2. Ok/ All right	<ul style="list-style-type: none"> ▪ “I think it was alright” ▪ It’s ok. I mean it was kinda fun”
3. Boring/ Didn’t like (part or all)	<ul style="list-style-type: none"> ▪ “It was boring at times but I did learn a lot” ▪ “Kinda of hard and boring”
4. Not Sure	<ul style="list-style-type: none"> ▪ “I do not know”

Item 2 on the Student Trunk Evaluation asked students, “What activities or items did you like *best*? Why?” Responses are summarized by grade in Figures 4.12 through 4.15.

Figure 4.12: 5th grade responses to activities or items liked best

Activity or item	# of students who wrote that activity
Diminishing Returns (outdoor relay)	10
PB & J Station	9
Smiley circuit balls	5
Videos	5
Bill Nye videos	4
Station Break Activity	3
Toy Station	2
Liked everything	2
Electricity Discovery Kits/ Circuit Circus	2
Group activities	1
Watt Meter	1
Noise Station	1
Radiometer	1

Figure 4.13: 6th grade responses to activities or items liked best

Activity or item	# of students who wrote that activity
Electricity Discovery Kits/ Circuit Circus	12
Radiometer	7
Station Break Activity	6
Bill Nye videos	3
Movies	3
Toy Station	2
Hair Dryer Station	2
Photocell kit	2
Station with radio	1
Cost of Using Energy Activity	1
Music Station	1

Figure 4.14: 7th grade responses to activities or items liked best

Activity or item	# of students who wrote that activity
Diminishing Returns- outdoor relay	14
Radiometer	13
Electricity Discovery Kits/ Circuit Circus	8
Station Break Activity	6
Bill Nye videos	4
Watt Meter	3
Toy Station	3
Rubber band Station	2
Coal samples	2
Smiley circuit balls	2
All of the activities	1
No favorite	1
Movies	1
PB & J Station	1
Cost of Using Energy Activity	1
Energy Sample Box	1
Photocell Kit	1

Figure 4.15: 8th grade responses to activities or items liked best

Activity or item	# of students who wrote that activity
Electricity Discovery Kits/ Circuit Circus	15
Station Break Activity	10
Potato Clock Activity (added by one teacher)	4
Diminishing Returns- outdoor relay	3
PB & J Station	3
Hands-on activities	2
Some movies	1
Group activities	1

Item 3 on the Student Trunk Evaluation asked students, “What activities or items did you like *least*? Why?” Responses are summarized by grade in Figures 4.16 through 4.19.

Figure 4.16: 5th grade responses to activities or items liked least

Activity or item	# of students who wrote that activity
Liked everything	14
At Watt Rate	6
Stations b/c people were fighting	2
Rubber band Station	2
Bill Nye videos	2
1 Bill Nye video b/c we watched it twice	2
Diminishing Returns b/c we got soaked	2
“Don’t know”	1
Electricity Discovery Kits/ Circuit Circus	1
Toy Station	1
Noise Station	1
Energy Sources box	1
Videos	1

Figure 4.17: 6th grade responses to activities or items liked least

Activity or item	# of students who wrote that activity
All were good	4
Bill Nye videos	4
Movies	3
Note-taking/ writing	3
When we just talked	2
Station Break- too much work	2
Rubber band Station	2
Cost of Using Energy Activity	2
Electricity Discovery Kits/ Circuit Circus	2
Station with a hair dryer	1
Noise Station	1
Some Stations	1
All sort of boring	1
Some activities were boring	1
Radiometer	1
Tests	1

Figure 4.18: 7th grade responses to activities or items liked least

Activity or item	# of students who wrote that activity
PB & J Station	7
None- all were good	6
Fragile Earth video	6
Rubber band Station	4
At Watt Rate	4
Simple Things You Can Do... video	3
Movies	3
Bill Nye videos	2
All	1
Not enough Electricity Discovery Kits	1
Broken stuff	1
Toy Station	1
Cost of Using Energy Activity	1
Radiometer	1
Energy Sample Box	1
Stations, and having to answer questions	1
Diminishing Returns	1
Watt Meter	1

Figures 4.19: 8th grade responses to activities or items liked least

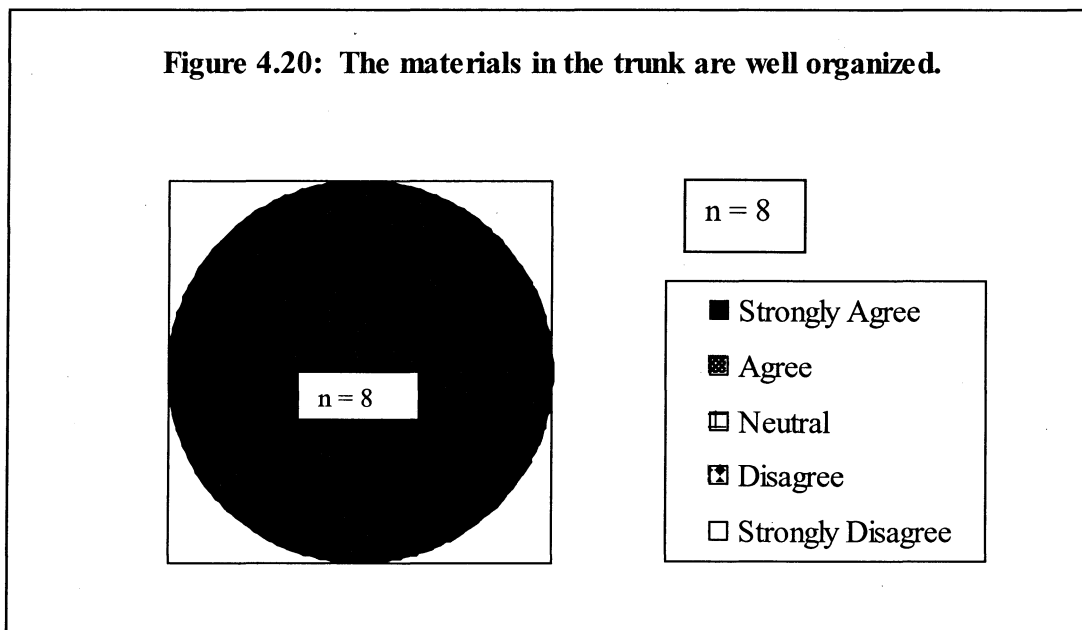
Activity or item	# of students who wrote that activity
At Watt Rate	8
None, all were good/ interesting	6
Some or all of Station Activity	4
Homework	3
Just sitting and looking at lights	1
Taking notes	1
Radiometer	1
Taking tests	1
Everything dumb	1
Talking about electrical conversions and terms	1
Not sure	1
Rubber band Station	1

Teacher Trunk Evaluation

The eight teachers in the experimental group responded to a sixteen item questionnaire after using the Energy Trunk in their classroom. Responses from the first eight items, asked on a Likert-type scale, were quantitatively summarized. Teacher comments respective to each item are provided after each quantitative summary.

The second set of eight items were asked in an open-ended format, but were also quantitatively summarized. Comments given by teachers are also provided.

Figure 4.20 summarizes responses to item 1, “The materials in the trunk are well organized.”

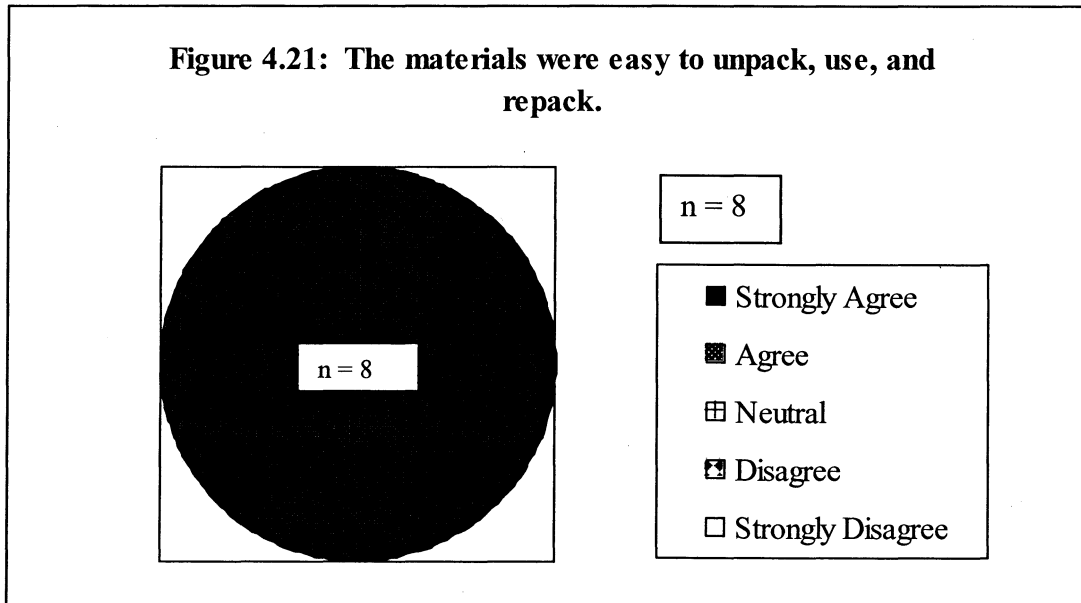


Comments provided by teachers, listed by grade, with respect to item 1 consisted of the following:

- ❖ “The labels were very helpful!” (5th)

- ❖ “☺” (5th)
- ❖ “Excellent job ☺” (6th)
- ❖ “The packaging was very suitable...The organization made it very easy to set up labs/ demonstrations.” (7th)
- ❖ “Nice flow to the unit. Interesting hands-on activities to reinforce what we were learning. Good organization in trunk with containers, etc.” (8th)

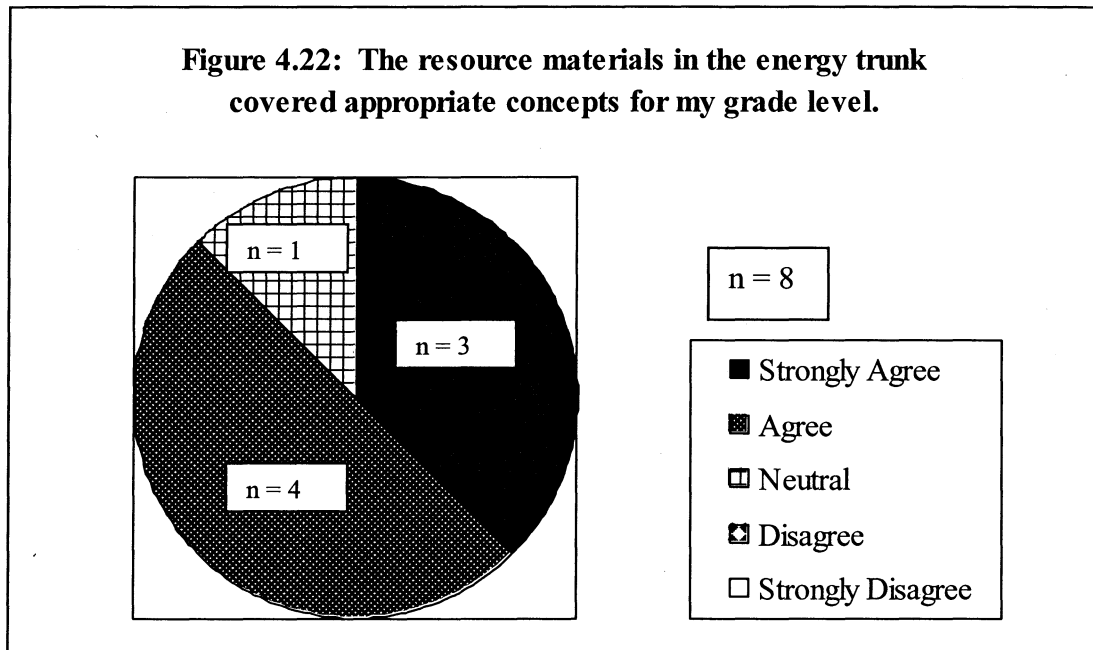
Figure 4.21 summarizes responses to item 2, “The materials were easy to unpack, use, and repack.”



Comments provided by teachers, listed by grade, with respect to item 2 consisted of the following:

- ❖ “☺” (5th)
- ❖ “The tubs were easy to organize.” (5th)
- ❖ “The labeling on the containers really helped with this ☺.” (6th)
- ❖ “Your notes helped a lot. I suggest covering them with clear tape.” (6th)
- ❖ “The materials were easy to use.” (7th)
- ❖ “Very nice—lists and labels. Boxes labeled.” (8th)

Figure 4.22 summarizes responses to item 3, “The resource materials in the energy trunk covered appropriate concepts for my grade level.”

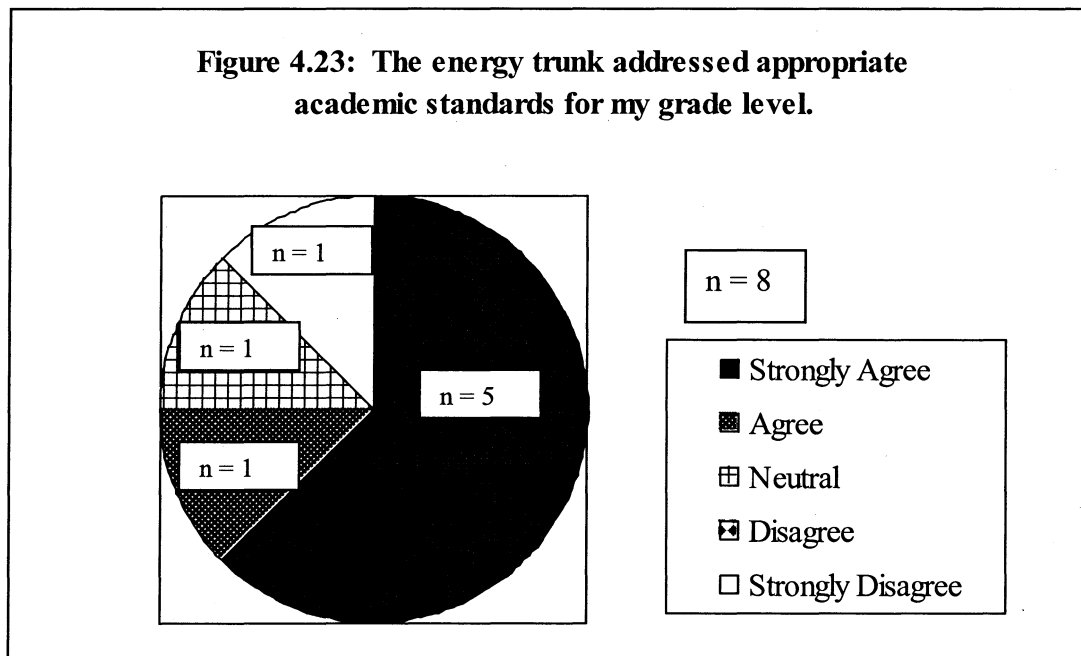


Comments provided by teachers, listed by grade, with respect to item 3

consisted of the following:

- ❖ “The first four activities and the Bill Nye videos were perfect for fifth grade (also the ‘school’ video). The further on through the binder that we worked the more difficulty my students had comprehending.” (5th)
- ❖ “Doing the math for the At Watt Rate and Cost of Using Energy [KEEP activities] was difficult for some lower ability students.” (5th)
- ❖ “Most did. Students had done circuits in 4th, but needed a refresher.” (6th)
- ❖ “The students enjoyed the posters and CD Rom.” (6th)
- ❖ “I supplemented with some science equip. & supplies from home. Energy Sources Lab: added diesel fuel, gasoline, motor oil, firewood,...etc.” (7th)
- ❖ “Some of my 7th grade students had difficulty with the math involved in the activity ‘At Watt Rate.’ (7th)
- ❖ “They commented on some difficulty, but I believe it was all easy enough for them to understand and complete.” (8th)

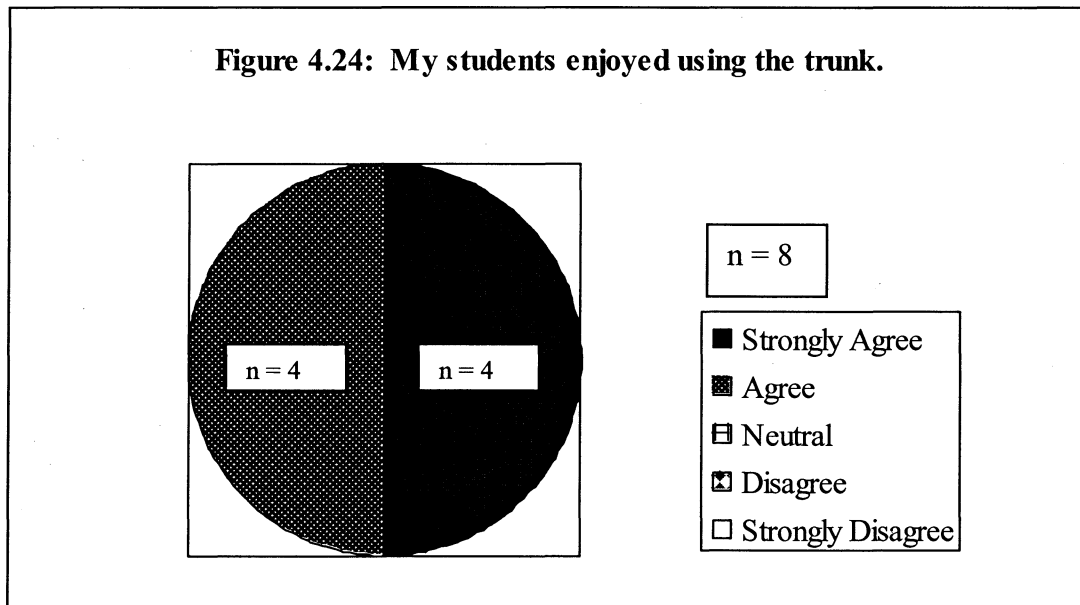
Figure 4.23 summarizes responses to item 4, “The energy trunk addressed appropriate academic standards for my grade level.”



Comments provided by teachers, listed by grade, with respect to item 4 consisted of the following (examples of standards covered by the trunk are given):

- ❖ “☺” (5th)
- ❖ “Many Environmental Ed. Standards addressed. Not so many science for my grade level.” (6th)
- ❖ “In my school all of the energy standards and benchmarks (except those related to food web) are in 8th grade science. Screwy, but that’s the way it is.” (6th)
- ❖ “National Standards A (inquiry-based learning), C (ongoing assessment), D, Assessment Standard C (fair assessment); Physical Science Standards (transfer of energy); Content Standards 5-8 (transfer of energy; motions and forces).” (7th)
- ❖ “Standards N and K.” (7th)
- ❖ “Good math tie-in concepts. Excellent Science and incorporates Agriculture.” (8th)

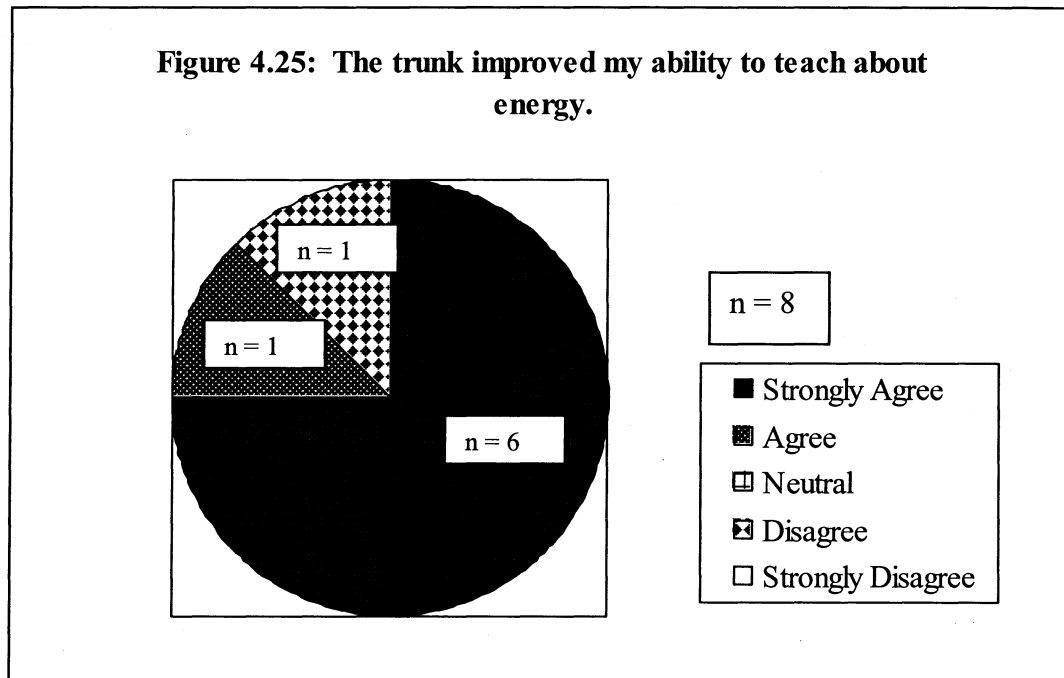
Figure 4.24 summarizes responses to item 5, “My students enjoyed using the trunk.”



Comments provided by teachers, listed by grade, with respect to item 5 consisted of the following:

- ❖ “☺” (5th)
- ❖ “Stations- very active & fun. Light-buzzing balls were also great.” (5th)
- ❖ “A few mixed comments on evaluation- overall they really enjoyed the activities.” (6th)
- ❖ “There were lots of ‘butts up’ experiences (kids so into it that they put knees on their chairs & lean over the table to get closer to the action).” (6th)
- ❖ “The students learned a lot and had fun doing science.” (7th)
- ❖ “Especially liked the station labs and H2O simulation [within Diminishing Returns activity]. Some even liked Bill Nye!” (7th)
- ❖ “A few who didn’t see the tie-in to Agriculture—Most enjoyed the hands-on activities and flow to learning.” (8th)
- ❖ “I had 6 special populations in my class.” (8th)

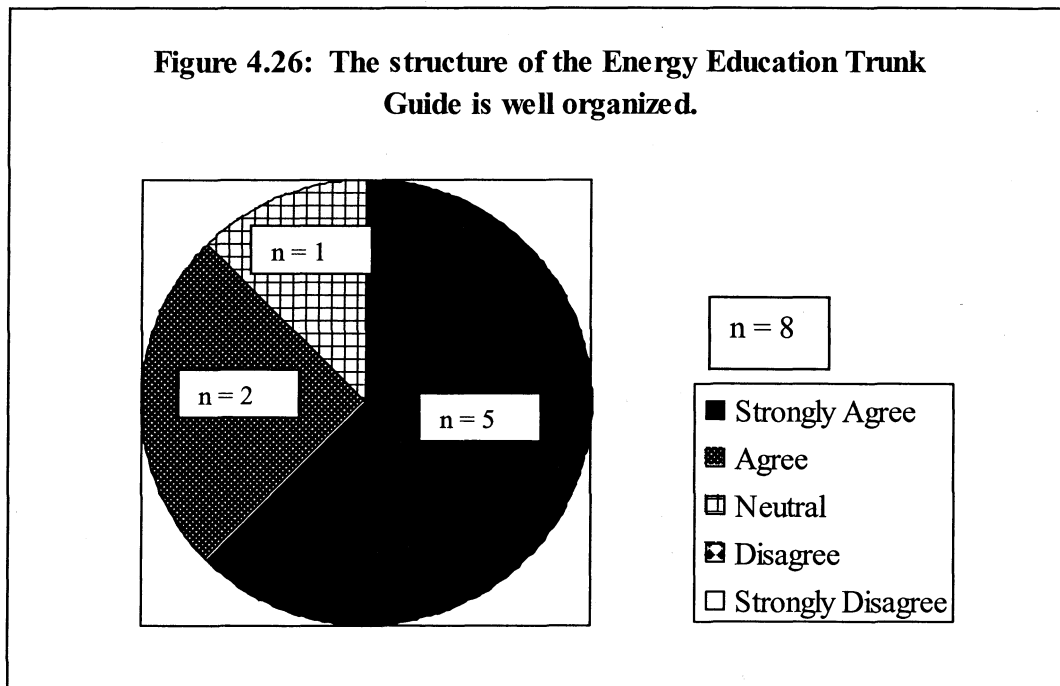
Figure 4.25 summarizes responses to item 6, “The trunk improved my ability to teach about energy.”



Comments provided by teachers, listed by grade, with respect to item 6 consisted of the following:

- ❖ “☺” (5th)
- ❖ “It was great having the supplies at my fingertips.” (5th)
- ❖ “The more materials I have, the better I am able to teach.” (6th)
- ❖ “The materials provided made it very easy to illustrate energy concepts/sources.” (7th)
- ❖ “Great.” (8th)
- ❖ “I have a KEEP Activity book [Guide] but this is the first time I really tried any of the activities. If I had to line up all of the stuff...I just never seem to find the time.” (8th)

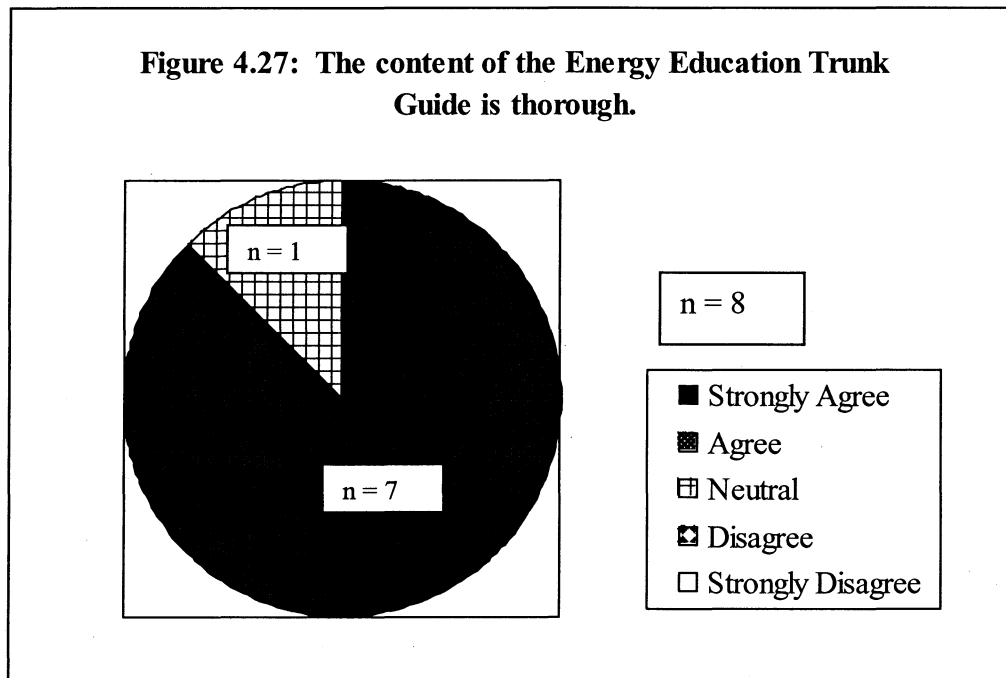
Figure 4.26 summarizes responses to item 7, “The structure of the Energy Education Trunk Guide is well organized.”



Comments provided by teachers, listed by grade, with respect to item 7 consisted of the following:

- ❖ “☺” (5th)
- ❖ “It starts with the basics and builds on them.” (5th)
- ❖ “Good job—Add your objectives for each activity.” (6th)
- ❖ “The scheme made a logical sequence of activities. One activity led to the next.” (7th)
- ❖ “While I have the KEEP Activity Guide, this better organized a unit for me. It was ready to go!” (7th)
- ❖ “All there for me to understand ahead and pass concepts on to students.” (8th)

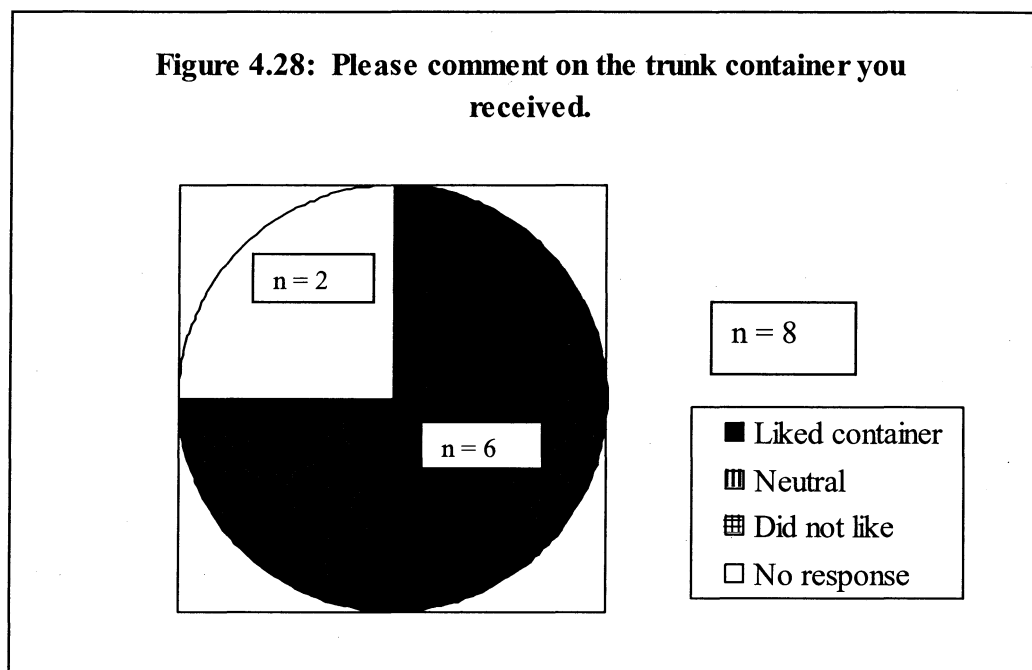
Figure 4.27 summarizes responses to item 8, “The content of the Energy Education Trunk Guide is thorough.”



Comments provided by teachers, listed by grade, with respect to item 7 consisted of the following:

- ❖ “☺” (5th)
- ❖ “It covered all aspects of energy: types – uses – saving.” (5th)
- ❖ “For my grade level, yes.” (6th)
- ❖ “A remarkable source of information relating to energy education content. A plethora of content.” (7th)
- ❖ “I copied the guide for several other science teachers...” (7th)
- ❖ “Many good items. I added a potato clock that we powered with a variety of items—including potatoes. And we did the Digging for Coal lesson to discuss land reclamation.” (8th)

Item 9 on the teacher trunk evaluation asked teachers to comment on the trunk container that they were sent. There were three different containers used for the eight classes that piloted an Energy Trunk; however, all materials were identical within each trunk container. Different containers were chosen based on “shippability,” aesthetics, size, ease with which materials could be organized, ease with which the trunk could be transported by the teacher, etc. Teachers’ comments were organized under four categories: liked the trunk container, neutral, didn’t like the trunk container, and no response given. A summary of the responses is shown in Figure 4.28.

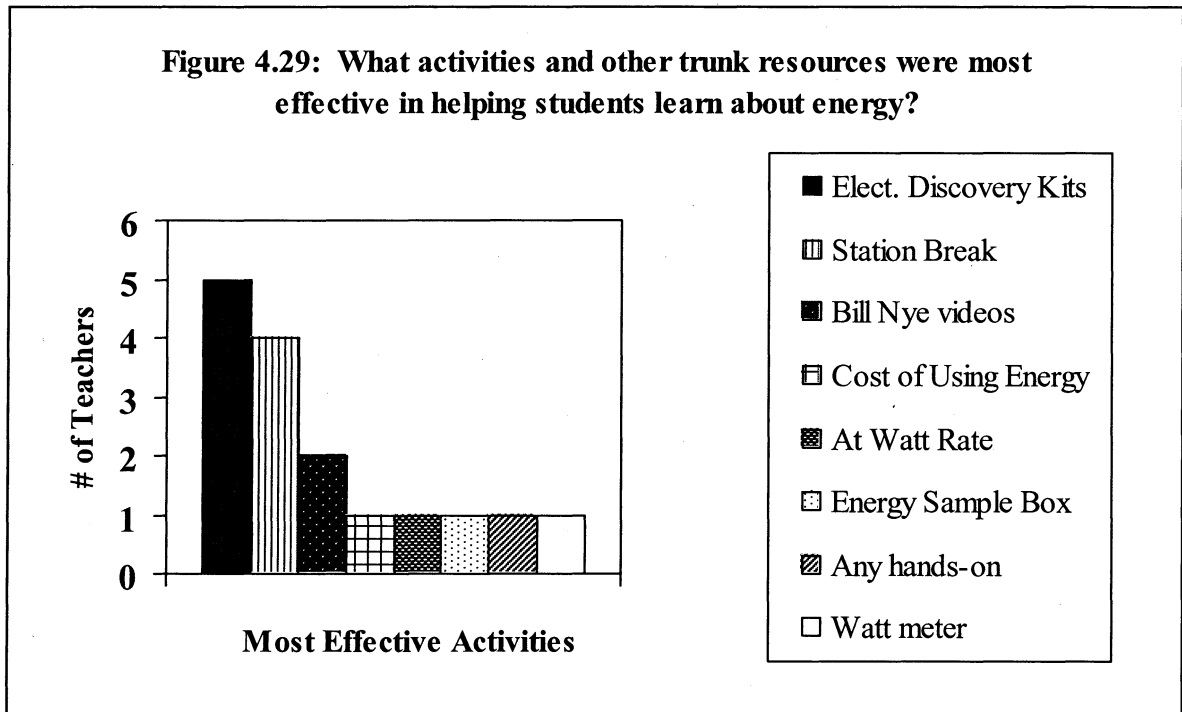


Comments provided by teachers, by grade, for item nine consisted of the following (Refer to pages 50 – 51 to see photos of trunk containers A, B, and C):

- ❖ “The trunk stored easily in my classroom. Its look gave it an element of mystery and surprise.” (5th; Trunk B)

- ❖ “Once I figured out how to open it, I liked it. I tried to pull the top tray out. Thank goodness I was unsuccessful! The handle and wheels were great! Compartments worked well. You did a good job organizing them in the trunk and labeling them so they fit back in.” (6th; Trunk A)
- ❖ “The trunk was well-organized. Contained materials to complete activities in the guide. Good in all areas listed above [aesthetics, size, etc.]” (7th; Trunk C)
- ❖ “Very secure, easily stored in classroom, I LIKE the wheels for easy transport.” (7th; Trunk A)
- ❖ “Very well organized and easy to repack.” (8th; Trunk C)
- ❖ “Wheels were a plus. It was a little hard opening the bottom compartment.” (8th; Trunk A)

Item 10 on the teacher evaluation asked teachers, “What activities and other trunk resources were most effective in helping students learn about energy, and why?” Figure 4.29 below gives a summary of the number of teachers who listed a particular activity in the trunk as being more effective in helping students learn about energy.



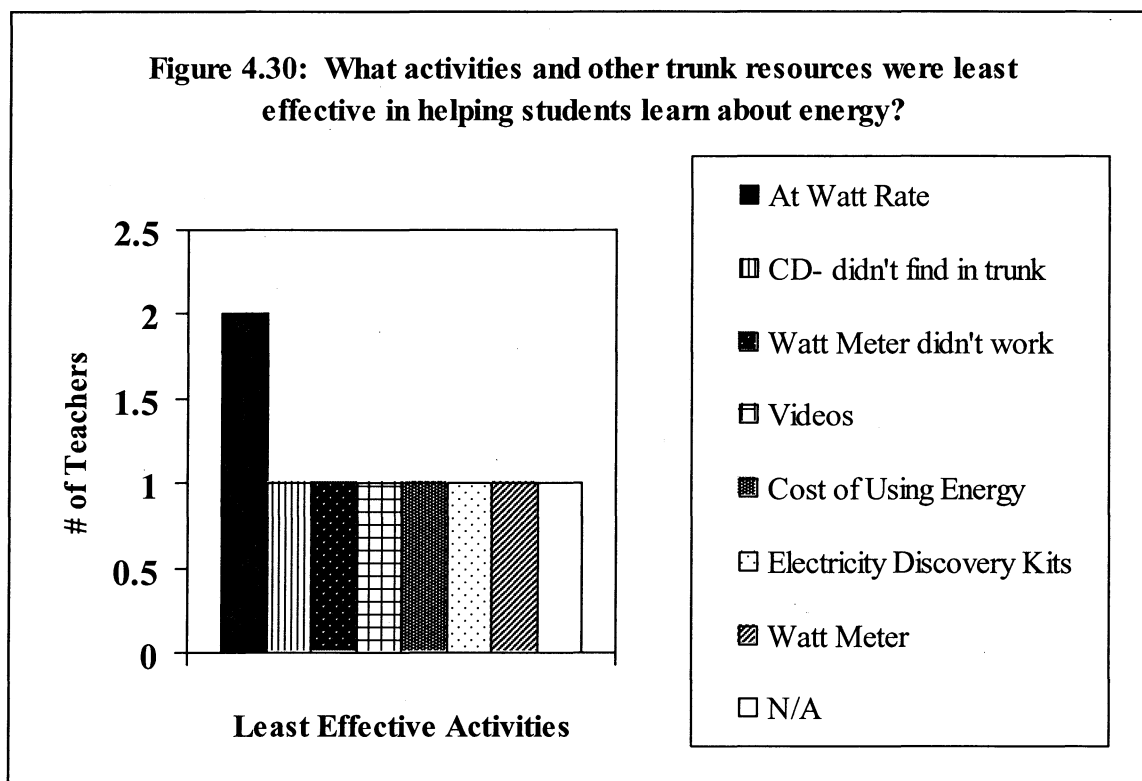
Comments made by teachers, identified by grade, with respect to item 10

consisted of the following:

- ❖ “The videos with Bill Nye were very engaging. The sets of batteries, wire, & lights [Elec. Discovery Kits] helped them understand how energy travels.” (5th)
- ❖ “The materials for Circuit Circus [Electricity Disc. Kits] were excellent.” (7th)
- ❖ “The energy stations to learn about energy transfer [Station Break]—they did well and carried those concepts throughout the entire unit.” (8th)

Item 11 on the teacher evaluation asked, “What activities and other trunk resources were least effective in helping students learn about energy, and why?”

Figure 4.30 below gives a summary of the number of teachers who listed a particular activity in the trunk as being less effective in helping students learn about energy.



Comments made by teachers, identified by grade, with respect to item 10

consisted of the following:

- ❖ “The students didn’t really get the Watt Meter. Maybe I didn’t explain it well enough.” (5th)
- ❖ “The videos—although entertaining the students did not learn much from them. A worksheet with good questions about the videos would add learning value to the video.” (6th)
- ❖ “Circuit activity [Elect. Discovery Kits] as it presently exists. If I didn’t have similar supplies it wouldn’t have been something everyone could do hands-on.” (6th)

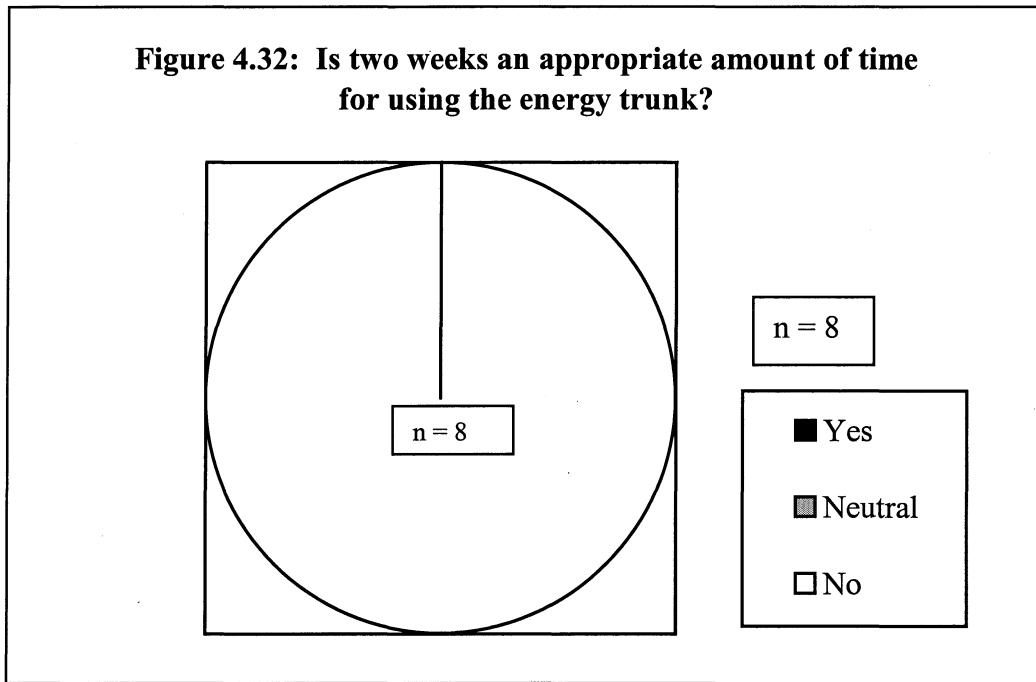
- ❖ “Calculating energy efficiency, watt rates, and appliances was difficult for many 7th graders, impossible for some. The light bulb comparison cost had to be done on the board for some students. Difficult but valuable data!” (7th)
- ❖ “I didn’t find the CD Rom or use that—space & computer access are limited.” (8th)
- ❖ “The Watt activities—I had a poor response on the take home assignment—nothing new for this class.” (8th)

Item 12 on the teacher evaluation asked, “Did you exclude any activities or other resources when you were teaching from the trunk? If so, what and why?” Figure 4.31 summarizes the responses of the teachers by grade.

Figure 4.31: Did you exclude any activities when teaching from the trunk?

Teacher	Activity	Why?
5 th	None	
5 th	Cost of Using Energy and Renewable Energy & Fueling Future posters	Time and “felt it was over the students’ heads.”
6 th	At Watt Rate	Time; math too difficult
6 th	Everything after Circuit Circus	Time
7 th	None	
7 th	CD Rom	Time
8 th	Cost of Using Energy	Time; repeat of some information
8 th	Energy Samples	Time

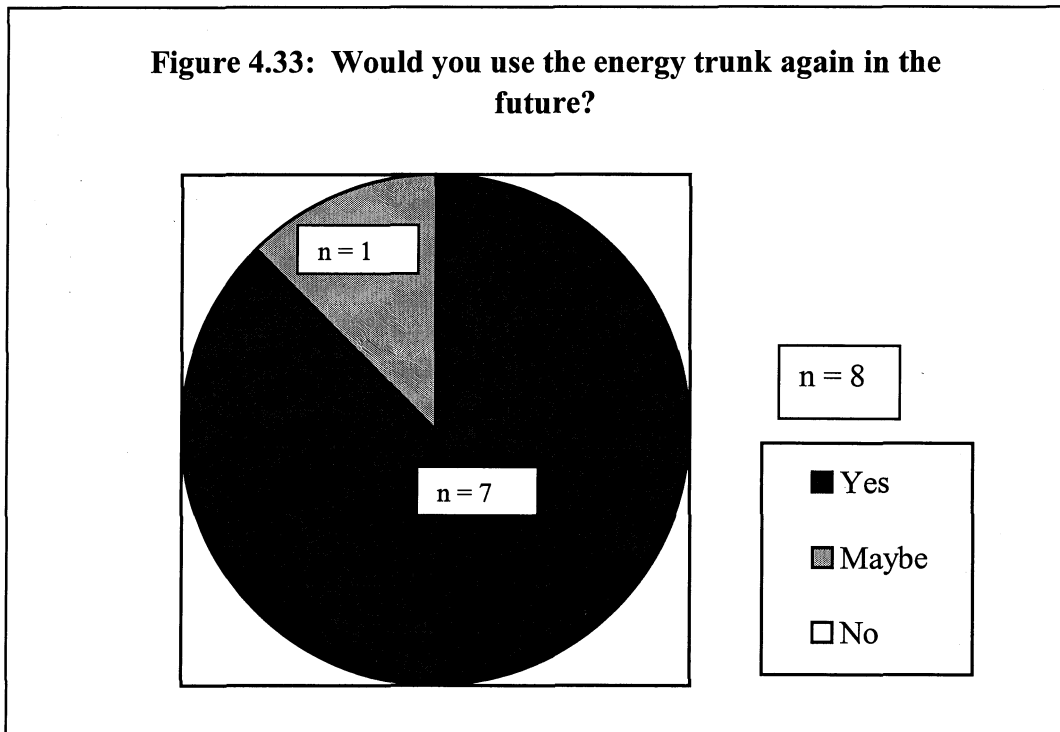
Item 13 asked, “Is two weeks an appropriate amount of time for using the energy trunk?” Figure 4.32 below summarizes teachers’ responses.



There was general consensus in the comments made by teachers with respect to item 13 in that 3-4 weeks is a more appropriate amount of time for teachers to use the trunk.

Responses to item 14, “Would you use the energy trunk again in the future?”

Why or why not?”, are summarized in Figure 4.33 below.

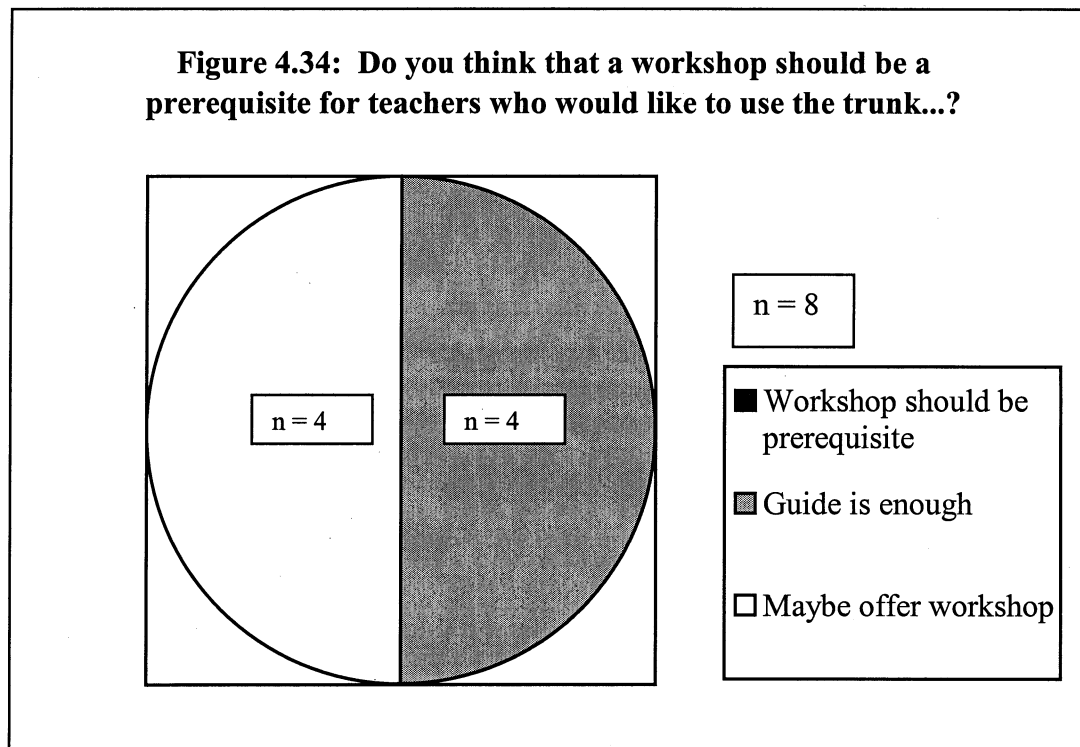


Comments made by teachers, identified by grade, in response to item 14

consisted of the following:

- ❖ “Definitely yes.” (5th)
- ❖ “Yes, it was great having all the activities ready and available.” (5th)
- ❖ “Yes, students enjoyed the materials and got a lot out of them.” (6th)
- ❖ “If the materials related to my 6th grade standards and benchmarks.” (6th)
- ❖ “Yes, I would be very happy to use the energy trunk every year that we cover energy.” (7th)
- ❖ “Yes, each 7th grade team in our building (3) and at John Muir (3) would love to use it next year!” (7th)
- ❖ “Yes. I thought it was excellent—Students learned from it and hopefully will be more energy efficient users.” (8th)
- ❖ “Yes, depending on the pre and posttest results.” (8th)

Responses to item 15, “Do you think that a workshop should be a prerequisite for teachers who would like to use the trunk, or do you think that the Guide is enough?”, are summarized in Figure 4.34 below.



Comments provided for item 15, identified by grade, consisted of the following:

- ❖ “The guide was sufficient.” (5th)
- ❖ “I think the Guide is enough.” (5th)
- ❖ “Depends on their experience and comfort level for teaching about energy.” (6th)
- ❖ “No workshop. Teachers have full plates—too many organizations are already pulling us this way and that. KEEP activities are well organized and give ample background.” (6th)
- ❖ “A workshop would be very beneficial.” (7th)

- ❖ “No workshop necessary, but could be offered for teachers who want or need a little extra help.” (7th)
- ❖ “I think the Guide is enough as it is so well organized and easy to understand. The workshop helps add extras to the unit.” (8th)
- ❖ “The Guide is enough. After some (next day) thought I change my mind. If I had went through the trunk a second time I’m sure I would do a much better job of it. Maybe have a workshop as an option. Seeing the activities in a workshop would have made the activities a little bit smoother for me. It might be hard for some teachers to do the workshop thing?” (8th)

The final item on the teacher evaluation, item 16, asked the teachers: “Other comments or suggestions that you have about the trunk?” Their responses are listed below by grade.

- ❖ “Longer time would be helpful.” (5th)
- ❖ “It’s a great resource and very teacher friendly! The assessment questions/ answers were phrased in a manner that made it confusing for some of my students (particularly #13 & #9). I tried explaining them to the students to clarify the meaning.” (5th)
- ❖ “Create questions to go with the videos. Have separate document that identifies goals/objectives for each activity. This could be part of the sequence of activities.” (6th)
- ❖ “My largest concern about these materials relates to their durability...if the materials for the circuit activity are not improved (note the alligator clips that I sent) don’t bother. It will cause more headaches than it’s worth. The batteries died 20 min. into the second 45 min period! Toys need to be sturdy. It would be nice to have more [photocell kits]. Send extra rubber bands, lights, and maybe some small gauge wire. Also include wire cutters... The kids enjoyed everything they did.” (6th)
- ❖ “Continue to expand the program. Have trunk series 1, 2, 3 etc. to cover additional KEEP activities. Also, send along with the kit, the source or vendor where teacher can purchase the items. Perhaps KEEP may come to sell items as a profit making venture or service to teachers. I really think you’ve got a wonderful resource here. I believe the trunk will act as a catalyst to promote the use of KEEP activities. Congratulations on a job well done.” (7th)

- ❖ “I would be happy to present the Energy Trunk Project at the _____ conferences.” (7th)
- ❖ “Great job on organization! I felt the experience was worth it for my students.” (8th)
- ❖ “Maybe add a potato clock—the students enjoyed that and it was our kick-off to the lesson. This was an excellent opportunity. Thank you for letting me take part in your study.” (8th)

Subproblem Four Results

Subproblem 4. What is the best strategy for disseminating the trunks?

In determining a dissemination strategy, each trunk program must decide on a plan to include whether the product will be loaned, leased, or sold; how much it will cost; how it will be organized; how it will be shipped; how it will be advertised; and whether or not incentives will be created to encourage use of the resource. The dissemination strategies of several trunk programs are described below, under the heading of the organization that administers the program. These results were obtained from interviews conducted by the researcher, and aided in the creation of a strategy for disseminating the Energy Trunks. Following discussion of the results of the interviews, results of the Energy Trunk pilot related to an Energy Trunk dissemination strategy will also be given. Chapter five will discuss a final dissemination strategy for the Energy Trunks based on these results.

Trunk Dissemination Strategies

Science Museum of Minnesota

According to James Heintzman (2002), Coordinator of Educational Materials, the Science Museum of Minnesota in St. Paul, MN rents their eleven different trunks to teachers on a first come, first served basis. The trunks are not sold. The teacher is sent an Operator's manual in advance, and when the trunk comes, it has a packing diagram, a checklist with all of the trunk's items listed, and a reminder of when the

trunk needs to be packed up and ready to be picked up. UPS was the commercial delivery service first used to ship out and pick up the trunks, but due to poor handling of some of the trunks the Museum replaced them with Spee Dee Delivery. Teachers are allowed to keep the trunks for as long as they like. The cost is \$95 for one week, \$150 for two weeks, and \$50 for each additional week. The only incentives given in the program are reduced rates and advanced notice of price increases to past customers. The trunks are advertised in a few ways. They are included in the museum's education catalogue, which is sent to every school in Minnesota, western Wisconsin, and northern Iowa. They are displayed at conferences, and some are given away at workshops. They are posted on the museum's website, and are included in a brochure for outreach programs. In addition, they are advertised by word of mouth.

Illinois Department of Commerce and Community Affairs

The Illinois Department of Commerce and Community Affairs – Bureau of Energy and Recycling in Springfield, IL has a trunk called “The Case for Buying Recycled: Investigating the Fourth R.” According to the Coordinator of the program, Missy Olinger (2002), their trunks are loaned for about two weeks at no cost to teachers, and the Bureau pays for all shipping to and from the school. Prior to receiving the trunk, the teacher must fill out a request form, where s/he agrees to have the trunk ready for pick-up on the designated day. On the form, it also states that if mailing instructions are not followed the teacher is required to ship it back overnight at a cost of about \$70. The agreement form also states that the teacher agrees to complete an evaluation form, which accompanies the trunk on brightly colored paper.

The Bureau uses UPS to ship the trunks and has had no problems. Incentives to use the trunk are sometimes used in the form of free pencils made out of recycled material and/or bookmarks with "10 Good Reasons to Recycle" or "Ways to Reduce Your Use." The trunks are advertised in several ways. There is a small, engaging brochure that has been created, which is sent out to teachers and potential users. Information about the trunks is included in quarterly newsletters with quotes from teachers who have used the trunk. Contact is made with Recycling Coordinators throughout the state, as well as with PTAs, homeschoolers, the Department of Natural Resources, the Environmental Protection Agency, and others, to increase awareness about the trunks. The trunks are also set up at conferences to help in advertising the program. Olinger stated that other potential audiences for the trunk might be scout, 4-H, women's, and senior citizen groups. She also noted that the trunk is more popular during certain times of year, such as Earth Day, America Recycles Day, and the springtime in general.

National Wildlife Federation

The National Wildlife Federation (NWF), located in Reston, VA, has a Wolf and Prairie Trunk program. According to the Program Coordinator, Alana Groshong (2002), the trunks are rented for three weeks at a cost of \$50, which is put towards shipping. The trunks are not sold. When a teacher wants to lease a trunk they first fill out a request form. If after using the trunks, they are returned with missing items then the teacher is responsible for covering the cost of replacing them. NWF uses UPS to ship their trunks, though they have had some trouble with UPS picking them up

remotely and returning them on time. In terms of incentives, they have not been needed because demand has been high enough to make them unnecessary. The trunks are advertised on the NWF website (www.nwf.org) and through word of mouth (from NWF Field Coordinators, Education Staff, and those who have used the trunks).

Groshong noted that the dissemination component is, overall, the hardest part of the program. Some tips she gave to help dissemination run a little more smoothly is to phone or email teachers with a reminder to have the trunk ready at the designated pick-up time and place, and to extend the loan period when the trunk is able to reach more students (for example, more classes in a school) or it is not a busy time of the year.

Assateague Island National Seashore

Rachelle Daigneault and Liz Davis coordinate the “Beach in a Box” traveling trunk program out of Assateague National Seashore in Berlin, MD. Daigneault (2002) informed the researcher that the trunks are loaned to local teachers for \$10 per week. Local teachers pick up and drop off the trunks themselves. Teachers out of the local area can borrow the trunks and they only have to pay the shipping costs, they do not have to pay the \$10 fee that local teachers pay. Like NWF, Assateague has not created an incentive program because they say the demand for the “Beach in a Box” is already very high. As far as advertising, Daigneault says that they do not do very much because they are already overbooked with the three trunks they have. Though, she said that they do have trunk fliers at the front desk of the Visitor Center.

Beaver Creek Nature Reserve

The Beaver Creek Nature Reserve in Fall Creek, WI has fifteen different “Wonder Walks” backpacks ranging in themes such as “Winter” and “Frogs.” According to Rick Koziel (2002), Executive Director, the packs are kept for visitors to the Center; however, they are loaned to local elementary teachers for about one week for free. The teachers are responsible for pick-up and return. The packs are advertised through articles in the Nature Center’s newsletter, through a brochure listing all of the resources the Nature Center has to offer that is sent to local schools, and through the Wisconsin CESA (Cooperative Educational Service Agency) offices.

Rocky Mountain Elk Foundation

The Rocky Mountain Elk Foundation, located in Missoula, MT, created a “Wild about Elk Trunk.” Jodi Bishop (2002), of the Elk Foundation, said that teachers in the local area can come and check them out but that the Foundation does not ship them out to teachers. The Foundation gave free trunks to Project WILD Coordinators across the country as part of a grant the Foundation gave to Project WILD to develop curriculum for the trunk. After they were given to Project WILD they were sold at cost, about \$800. If individuals were not able to afford them, they were able to write a grant proposal and the Foundation would potentially pay for half of the cost. The Foundation is not creating any more Elk Trunks because they have already created and disseminated over 100, and so the demand is not as great as it once was. Advertising differs from state to state since the program is run by different Project Wild Coordinators.

Sigurd Olson Environmental Institute

Another trunk program, "The Loon Watch Activity Box," is run out of the Sigurd Olson Environmental Institute, located in Ashland, WI. Cory Counard (2002) coordinates the program and she said that the Loon Box is rented for \$50 per week in addition to shipping costs. The teacher handles shipping and insurance for return of the trunk. Prior to receiving the trunk teachers are asked to first sign a shipping agreement form. The Institute does not have much trouble receiving the trunk back on time, most likely because the teachers have to pay a weekly fee, according to Counard. As far as advertisement for the trunk, this is mostly done through a flier, displays at various programs, press releases, and other.

The National Energy Education Development Project (NEED)

The National Energy Education Development Project (NEED), located in Manassas, VA, has several different types of kits. According to Martha Callan (2002), NEED Curriculum Director, the kits are all sold, though some are also rented. NEED uses UPS to ship their kits and have had little trouble with their service. The cost the kits are sold for varies. Kits are generally rented for three weeks and cost \$150. Advertising the kits is done through the NEED catalogue and website. Workshops are also held for teachers to help them become familiar with the kits offered by NEED.

Summary of Dissemination Strategies

Dissemination strategies differ among trunk or kit programs. Many programs focus on loaning or leasing their trunk(s), though some concentrate primarily on selling them. When asked why NEED focuses mostly on selling their kits, Callan responded that renting is maintenance intensive, especially at the scale to which they produce the kits. Some programs have fewer trunks or kits, a different number of personnel, or simply different objectives and so loaning or leasing their trunks makes more sense than trying to create many for the purpose of selling them.

Costs for leasing trunks to teachers/leaders range from nothing to \$95 per week. Many programs are somewhere in between, where they primarily ask for shipping costs to be covered by the user, as well as replacement costs for damaged or lost items.

A few programs have basic incentives to encourage use of their trunks; yet, many do not. It appears that most programs have advertising strategies in place such as highlights in brochures, newsletters or on websites, and via participation in conferences or workshops. Word of mouth also seems to be a popular way that trunk programs get advertised.

Some trunk programs provide or suggest providing training programs for teachers prior to using the trunk. This can benefit the program by increasing the likelihood of success of the trunk in the classroom because the teacher may feel more comfortable with the resources and activities within the trunk. Many programs, though, do not have a trunk training program in place because of financial, time or

other constraints, or because they feel that their trunk guide or manual is sufficient for using the trunk effectively.

To many programs, the dissemination component can be the most challenging. It can be maintenance intensive, shipping problems can occur en route to or from the school, and teachers may not ship the trunks back promptly or may leave out items of the trunk. There are methods that can address some of these issues and make the dissemination of the trunks run more smoothly. Potential methods include using durable trunk containers, including a checklist with all of the trunk resources listed, making the trunk as user friendly in terms of unpacking and repacking as possible, renting trunks at a weekly rate, having teachers (and possibly principals) sign a trunk rental agreement form (Appendix U), coordinating all of the shipping to and from, sending out email or phone reminders of when the trunk is arriving and then later when it should be packed up and ready to be picked up.

Energy Trunk Pilot: Dissemination

There were a number of results from the Energy Trunk pilot that influenced the final strategy recommended for disseminating the trunks. These results focus on the areas of: 1) loan period, 2) trunk containers, and 3) training for using the trunk.

Teachers who piloted the trunks felt that the allotted two-week period was not sufficient for leading all of the activities in the trunk. A better amount of time, they suggested, would be three to four weeks.

Teacher comments concerning the trunk containers, of which there were three, were all positive. Each teacher received only one of the trunks so they were not able

to compare all three. However, the comments suggested that from the teacher's perspective any of the three containers would work well. The researcher found that each container has its own set of pros and cons. Trunks B and C held up better than trunk A with respect to shipping (refer to pages 50-51 for photographs of trunks A, B, and C). Although, trunk A is significantly less expensive, more attractive, and more easily organized than trunk C. Trunk A also has a handle and wheels which make it more easily transportable on site than trunk B.

As far as teacher training for using the trunk, 50% of teachers felt that the Trunk Guide was sufficient for preparing them to use the trunk, and the other 50% felt that it might be beneficial to offer a workshop for teachers before they would use the trunk. Yet, they did not express that training should be a prerequisite to using the Energy Trunk.

CHAPTER FIVE

SUMMARY, RECOMMENDATIONS, CONCLUSIONS, & IMPLICATIONS

Summary

The purpose of this study was to develop and evaluate an energy trunk, and to recommend a strategy for its dissemination. The researcher, together with KEEP staff, KEEP Adjunct Faculty, and members of the graduate committee, spent a period of two years on the development of this project. Development of the trunk resulted from interviews of existing trunk programs, review of existing energy related resources, chosen KEEP activities, and determined themes and grade levels appropriate for the trunk. Eight Energy Education Resource Trunks were created. All of the materials were consistent in the eight trunks; however, three different containers were chosen to also be piloted. The trunks were evaluated in eight classrooms through teacher and student questionnaires, as well as student pre/posttests (which were compared against eight other classrooms who did not have exposure to the trunk, but who took identical pre/posttests). Results concluded that the trunk was successful in both serving as a useful teaching tool for teachers, as well as a mechanism for engaging students. A dissemination strategy for the energy trunks is recommended based on review of dissemination strategies for existing trunk programs and data gathered from the trunk pilot.

Review of the Subproblems and Associated Recommendations

Subproblem 1. Are EE trunk programs effective in an educational setting, and what are the various components of an EE trunk program?

EE trunk programs are effective and valuable resources in educational settings. This was a clear conclusion of the interviews conducted of existing trunk programs. Trunk program coordinators attested to the value of their program for formal and non-formal educators. Quotes from students and educators supported this finding through their description of their experiences with the various trunks. Students found exploring the “hands-on” trunks to be an exciting experience, and teachers felt that they were a wonderful teaching resource and helped save a lot of time by gathering several resources together in one complete unit. One trunk program coordinator mentioned that the success of a trunk in an educational setting is influenced by the need for that topic area. In other words, if there is a lack of curricular resources in a particular topic area, then a trunk covering that topic area will be more effective and successful. Research into the effectiveness of trunk programs in an educational setting was mostly gathered from interviews due to a lack of literature on the topic.

Because educational resource trunks/kits are effective in an educational setting it is recommended that other EE organizations, and others, consider a trunk program, when appropriate, as a means towards effectively meeting their educational goals. Further support for this recommendation will be seen in the

review of subproblem 3 in this chapter, which addresses the effectiveness of the Energy Education Resource Trunk.

Use of an open-ended questionnaire and interviews found that the important components of a trunk program include the following (Appendix P):

- ❖ Physical nature of the trunk
- ❖ Contents
- ❖ Budget
- ❖ Piloting
- ❖ Evaluation
- ❖ Dissemination
- ❖ Maintenance

It is recommended that each of these areas be considered when developing trunk programs and other educational resources. The physical nature of the trunk deals with the container chosen to house the associated resources. When choosing a trunk container one must be mindful of its size, durability, security, transportability, cost, aesthetics, and so forth. The contents of the trunk are clearly a vital component of any trunk program. It is important to include a variety of resources, with an emphasis on ones that are hands-on in nature. Age appropriateness and durability are other important factors to consider when choosing the contents for a trunk. A program's budget will influence the number of trunks developed, the particular containers and contents chosen, and how the trunks will be disseminated. Though piloting trunks in formal or non-formal educational settings is not a regular

practice, as seen from the trunk interviews, it is a valuable one and one that should be considered when developing a new trunk. Piloting a trunk allows the trunk creator to gain useful information on how to improve the resource before final implementation of the program. Evaluation should happen in concert with the pilot and should remain an ongoing component of the program after final implementation. Evaluation may take the form of teacher and student questionnaires, as well as student pre/posttests. Dissemination and maintenance are also important components of a trunk program. Different dissemination strategies, to include loaning or selling trunks, as well as other factors, will affect the amount of maintenance involved.

Subproblem 2. What resources should be included in the Energy Trunk?

Resources chosen for inclusion in the Energy Trunk are a combination of energy samples, videos, posters, electricity discovery kits, a CD Rom, a watt meter, a radiometer, materials to support the chosen KEEP activities, and more. These contents provide students with a hands-on, minds-on approach to learning about energy. **It is recommended that other programs considering developing a trunk program have a combination of the types of materials similar to those chosen for the Energy Trunk. An effective trunk includes a diversity of materials that will engage students with diverse learning styles. Generally, an emphasis should be placed on hands-on items.**

A number of factors influenced which resources were included in the Energy Trunk. Factors included: data gathered concerning the contents of other trunks; appropriate level for the Energy Trunk audience; determined trunk themes; chosen KEEP activities; and availability of existing energy related resources.

A 5th – 8th grade audience was selected as the most appropriate for the Energy Trunk, due to topics covered and recommendations made by KEEP Adjunct Faculty. However, many activities in the trunk can be adapted for younger or older audiences. Trunk interviews showed that trunks are quite popular at the elementary level, and therefore it is **recommended that KEEP develop an energy trunk for grades one through four in the future if resources allow.**

Overall, the Energy Trunk's resources were very effective with both teachers and students as seen in the pilot study. However, some minor revisions of the trunk should be made to make it an even stronger resource. **Based on the Energy Trunk pilot, it is recommended that some items be replaced with more durable or effective ones.** Items to be considered for replacement include the Electricity Discovery Kits' alligator clips and wires, the battery-operated toys, the At Watt Rate activity, the Simple Things You Can Do To Save Energy in Your School video, and the Our Fragile Earth: Energy Efficiency and Renewables video. In addition, replacement D and AA batteries should be provided in the trunk for battery-operated toys, Discovery Kits, and other items to help keep the activities running smoothly for the educator.

In general, the At Watt Rate activity was less popular with teachers and students. It may be exchanged with another activity, though this is not necessary

because similar concepts are covered with the Cost of Using Energy and watt meter activities. If the trunk is utilized by a secondary teacher, then it may be appropriate to keep At Watt Rate in the suggested sequence of activities.

The Simple Things You Can Do to Save Energy in Your School video is much more popular with fifth grade than any other grade. **It may be beneficial to provide annotations for the videos and encourage teachers to use their judgment as to which videos their students would respond to best.** The Our Fragile Earth video is not the most popular item, especially with the seventh grade students. If possible, this video should be replaced with a more engaging one that also focuses on renewable energy and the concept of choices and challenges. **Also, as recommended by one teacher, it may add to the learning value of the videos to create questions to accompany them.**

While some resources within the Energy Trunk should be exchanged, overall, the resources in the trunk were a great success with both teachers and students as seen in the next section, "Subproblem 3."

Subproblem 3. To what extent is the Energy Trunk effective?

The Energy Trunk and its various resources, discussed in the previous section, were tested from teachers' perspectives, as well as from the students' perspective. Results suggest that the Energy Trunk was a highly effective educational resource.

Effectiveness from Teachers' Perspective

The main goal of this project was to create a tool that addresses teachers' need for more resources to help them teach about energy. Therefore, a questionnaire was created to aid pilot teachers in assessing the trunk's effectiveness.

The majority of teachers feel that the trunk's materials are well organized; easy to unpack, use, and repack; cover appropriate concepts for their grade level; and address appropriate academic standards for their grade level. Teachers also feel that their students enjoyed using the trunk, and most feel that the trunk improved their ability to teach about energy. In terms of the Trunk Guide, the majority of teachers feel that the content is thorough and that the structure is well organized. In addition, comments concerning the three different trunk containers were positive.

According to the eight pilot teachers, the most effective activities for helping their students learn about energy include the Electricity Discovery Kits (which supported the KEEP Circuit Circus activity), the Station Break activity, and the Bill Nye videos. Other activities listed as being effective include: the Cost of Using Energy, At Watt Rate, the Energy Source Sample Box, anything hands-on, and the watt meter.

Two out of the eight teachers reported that the least effective activity for helping their students learn about energy is the At Watt Rate activity. Other activities listed (by one teacher each) as least effective were the CD Rom (one teacher did not find it in the trunk), the watt meter (which did not work for one teacher), the videos, Cost of Using Energy, and the Electricity Discovery Kits (a teacher commented that

some components, like the wires and alligator clips, need to be replaced with more durable ones).

Teachers responded that the main reason for why certain activities were excluded, if they were, was a lack of time. Teachers feel they needed more time with the trunk and that three to four weeks would be an appropriate amount of time for loaning trunks in the future. As far as using the Energy Trunk again in the future, seven out of eight teachers say that they would. The one other teacher commented that s/he would if it better related to sixth grade standards and benchmarks. **Some suggestions that the pilot teachers gave with respect to the Energy Trunk included: providing more time with the trunk; clarifying assessment questions; creating questions for the videos; identifying goals/objectives for each activity; replacing some items with more durable ones; potentially adding a “potato clock” activity; and expanding the program to have additional trunks focusing on other KEEP activities.**

Teachers shared many positive comments about the Energy Trunk, such as “Very impressive job!”, [the materials] were “engaging” and “excellent”, “There were lots of ‘butts up’ experiences (kids were so into it that they put knees on their chairs and lean over the table to get closer to the ‘action)”, “It was great having the supplies at my fingertips”, “...this better organized a unit for me. It was ready to go!”, “The more materials I have the better I am able to teach.” Further support of the trunk as an effective teaching tool is seen in one teacher’s comment, “I have a KEEP Activity book but this is the first time I really tried any of the activities. If I had to line up all the stuff...I just never seem to find the time.” **These quotes express the**

high value of the Energy Trunk as an educational tool, and suggest that other EE programs may look to trunks, when appropriate, as a vehicle for effectively reaching more teachers and students.

Effectiveness from Students' Perspective

The main goal of the project was to assess the trunk's value as a teaching tool; however, to enrich the assessment the researcher evaluated the trunk from the students' perspective as well. Student pre/posttests assessed the trunk's ability to positively impact student knowledge gain, and attitude change with respect to energy. In addition, a student questionnaire evaluated potential strengths and weaknesses of the trunk.

A Nonrandomized Control Group Pretest-Posttest design was used, where eight classes (two per 5th, 6th, 7th, and 8th grade) served as the control group and eight classes (two per 5th, 6th, 7th, and 8th grade) served as the experimental group. Both groups took a pretest and then about two weeks later took a posttest. Pre and posttests were identical. Results indicate that the Energy Trunk had a significant impact on students' knowledge of and attitude towards energy.

A Solomon Four-Group Design is said to be a stronger test design than the Nonrandomized Control Group Pretest-Posttest design (Leedy, 1993). However, due to a number of factors the Nonrandomized design was the best design for the purposes of this study. True randomization of samples would have been difficult because of a short time frame, the necessity of pilot teachers to have been through a KEEP course (to provide some consistency and minimize teacher effect), and the

need for teachers to voluntarily decide to be a part of the pilot study. Though there was not true randomization in the test design, it is believed that the samples were a good representation of the potential population that may be served by the trunk.

In addition, the Solomon Four-Group design was not possible because it calls for half of the experimental group to receive the pre and posttest and the other half to only receive the posttest. This design would have required a greater number of classes because of class/teacher effect. More pilot classes would have meant that more trunks would have had to be created. This was not possible because of time and budgetary constraints.

Results of the student questionnaire indicate that the vast majority of students (about 138 out of the 173 who completed the student trunk evaluation form) enjoyed using the trunk. Students' *favorite* activities in the trunk vary by grade but the most popular are the Electricity Discovery Kits and Diminishing Returns activity (students commented specifically on the relay race component of the activity). The Station Break activity was also very popular. Students' *least favorite* activities were mixed. The most popular fifth grade response to their least favorite activity was "liked everything," where fourteen students responded with this answer. This response expresses the high amount of success of the Energy Trunk with fifth grade students. The most popular responses to this question for sixth graders were that they "were all good" or "Bill Nye videos"/ "movies" in general. Popular responses among seventh grade students included seven students commenting on the "Peanut butter & Jelly Station" because it got messy, and six students commenting that, "None, all of the activities were good." Eighth graders appear to like the At Watt Rate activity least,

where eight students gave this response. The second most popular eighth grade response was “None, all were good/interesting,” where six students gave this response.

Summary of Trunk Effectiveness and Discussion of Influencing Factors

Overall, it appears that teachers and students found the Electricity Discovery Kits, Station Break activity, Diminishing Returns activity (relay), and Bill Nye videos to be the best activities in the trunk. This may be due to their very engaging and hands-on (except for the videos) nature. The least popular activity among students and teachers appears to be the At Watt Rate activity. Some students did not seem to feel as engaged by it, and teachers commented on the math being difficult for some of their students. This activity may be more useful for secondary teachers who may use the trunk in their classroom.

Though At Watt Rate seems to be the least effective or favorite activity, the most popular response among all of the 5th – 8th grade students was “None, liked them all.” This response being the most common among the entire group of students who used the trunk attests to the strength of the Energy Trunk as an engaging, educational resource.

Factors beyond the control of the study may have influenced student results. One factor may have been how the activities were taught by each individual teacher. Different teachers have different teaching styles and levels of engagement. Another influencing factor may be that not every teacher conducted all of the activities in the

trunk. These and other factors likely had an influence on student responses to most and least favorite activities and how students did on the pre/posttests.

Keeping in mind that teacher effect may have had an influence, it appears that this Energy Trunk may work especially well with a fifth grade audience. This conclusion is a product of the results from the pre/posttests as well as the student trunk evaluation forms. Review of Figures A and B show that there was a more drastic change in knowledge and attitude mean gain scores for fifth grade versus any other grade. In addition, on the student trunk evaluation forms, zero fifth graders said that they did not like the trunk or think it was boring. In all other grades, there are at least some students who stated that part or all of the trunk was boring or that they did not like it. Also, the most popular fifth grade response to what activity they liked least was that they “liked everything” (14 responded). The second most popular response, “At Watt Rate,” was shared by 6 students, a much smaller number.

While it may be that this Energy Trunk works especially well with a fifth grade audience, results indicate that it is an effective resource to use in all four grades. For example, as seen earlier in Figure C the vast majority of students shared positive comments about the trunk. Also, the response on the student evaluation to “What activity or item did you like least?” of “None, all were good” was the most popular response for sixth grade (four students responded) and the second most popular response for seventh grade (six students responded) and eighth grade (six students responded).

In summary, results suggest that the Energy Trunk is both an effective teaching tool for educators and an engaging resource for students.

As it relates to KEEP, it is recommended that a summative evaluation is done after the aforementioned recommended revisions are made to the Energy Trunk. In addition, it is recommended that a follow-up test be given to classes in the pilot study to help determine whether there is retention of energy knowledge and a positive attitude toward energy conservation. Also, KEEP should maintain ongoing evaluation, through teacher and student evaluations, of the Energy Trunk once it is officially disseminated.

Subproblem 4. What is the best strategy for disseminating the Energy Trunks?

In order to create an effective dissemination strategy for the Energy Trunks initial data was gathered, via interviews, concerning the dissemination strategies of existing trunk programs. Information was obtained pertaining to whether they rent or sell their trunks, fees and time allotted for loaning trunks, maintenance issues, whether or not they use incentives, how they advertise, and more.

Other important aspects of a successful dissemination strategy were also gathered from the Energy Trunk pilot study in October and November 2002.

Based on data collected from trunk interviews and the pilot it has been determined that an effective dissemination strategy for the Energy Education Resource Trunks encompasses the following components:

- ❖ A combination of selling and loaning (with an emphasis on selling).

- ❖ Trunk A should be chosen for trunks which are sold. Trunk B or C should be used for trunks that will be shipped back and forth many times (See pages 50-51 for photographs of trunks A, B, and C).
- ❖ Duration of loan period – 4 weeks.
- ❖ Flat rate of \$150 for four week loan period to cover shipping and maintenance costs; additional weekly rate – \$30/week.
- ❖ Advertising should include: a trunk flier or brochure; highlights in KEEP's brochures, newsletters, displays, and/or website; trunk displayed at conferences and KEEP courses; "word of mouth" via KEEP Adjunct Faculty and teachers.
- ❖ Initial dissemination to teachers who have been through the KEEP course only. No prerequisite workshop necessary (though Guide accompanying trunk is essential). If program expands and trunk is offered to non-KEEP teachers, a workshop may be necessary.
- ❖ Incentives not necessary, though if difficult getting trunks initially disseminated may offer free CFL light bulbs (or other) to each class or student (depending on available funds).
- ❖ Have teachers sign and return a trunk rental agreement form before the trunk is sent to them (helps to ensure their understanding of the rental time period, etc.). Send exciting "prep" letter with the form to get teachers enthused and feeling more aware of what is "coming soon."
- ❖ Coordinate all of the shipping to and from the schools for the teachers.
- ❖ Do email or phone reminders of when and where loaned trunk will be picked up, a few days to a week before scheduled pick-up time.

It is recommended that dissemination of the Energy Trunks includes a combination of selling and loaning, with an emphasis on selling. An emphasis should be placed on selling the trunks because of the issues of maintenance and space within the KEEP offices. Marketing the trunk to a school as opposed to one teacher may be more effective in selling the trunks. Depending on their needs and desires a particular trunk container may be chosen, which has a significant effect on the total cost.

However, because of the ease with which trunk A can be organized and transported on site it is the best choice when selling the trunks.

Trunks should also be loaned because there will be occasions when teachers will not be able to obtain the needed financial resources to purchase a trunk. If funding increases for the KEEP program, it may be possible to provide grants to cover half of the total cost for teachers/schools. Trunks B and C will hold up better in shipping and so may be preferable for trunks that are loaned regularly. However, if trunk A is chosen for trunks which are loaned it is necessary to ensure that a protective layer of bubble wrap is placed around the top half of the trunk to protect the lock and compartment snaps.

For trunks that are loaned to teachers, the loan period should not be less than four weeks. Teachers who piloted the trunk in their classroom feel strongly that teachers should be given no less than three to four weeks with the trunk because of how many activities it contains. The flat rate for the four-week loan period should be \$150. This is an average price for loaning a trunk. Some trunk programs ask for only shipping costs to be covered, while others charge up to \$95 per week. The cost of \$150 for the four-week period appears to be reasonable. An additional weekly rate of \$30 will provide a structure where teachers are aware that they may have extra time if they request it, but also one in which a more timely return of the trunks will occur to prevent an additional charge to the teacher or school. If the trunk program proceeds well, loan fees (or the cost for selling a trunk) may be increased as a way to help support KEEP as an organization.

Advertising the Energy Trunks should include a combination of a flier or brochure specific to the trunk; highlights in KEEP's brochures, newsletters, displays, and/or website; being displayed at conferences and KEEP courses; and "word of mouth" via KEEP Adjunct Faculty and teachers. Many trunk programs cited the power of advertisement through "word of mouth."

Initial dissemination of the trunks should be to teachers who have been through the KEEP course only. Teachers who piloted the trunks had all been through a KEEP course. Four teachers feel that the Trunk Guide was sufficient for supporting teachers in their use of the trunk. The other four teachers feel that it might be helpful to offer a workshop, because, it would enable some teachers to feel more comfortable with the materials they would be later using with their students. If trunks are sold or loaned to teachers who have not been through a KEEP course, then it is recommended that a workshop be offered.

It is not necessary to offer incentives for buying or loaning the trunks. The majority of trunk programs interviewed do not offer incentives. However, if funds are available it may be a good way to kick-off the Energy Trunk program by offering free CFL light bulbs, or other, to the first 10 or so classes who buy/loan a trunk.

Methods for ensuring a smooth trunk loaning program should include having teachers sign and return a trunk rental agreement form, coordinating all shipping to and from the schools for the teachers, and sending email or leaving phone messages to remind teachers of when and where the trunk will be picked up as the pick-up date draws near. Accompanying the trunk rental agreement form should be an enthusiastic letter to help teachers get excited about using the trunk and feel more aware of what is

“coming soon.” A copy of the “Suggested Sequence of Activities” from the Trunk Guide should also be sent so that teachers can better prepare, and obtain the few items needed for the activities that are not provided in the trunk.

An effective dissemination strategy should start small and slowly expand, to build upon lessons learned and further strengthen this “electrifying” new program.

Summary of KEEP Recommendations

Energy Trunk revisions

Some minor revisions should be made to the trunk to ensure that materials are as durable, engaging, and effective as possible. Items to be considered for replacement are: the Electricity Discovery Kits’ alligator clips and wires, some of the battery-operated toys, the “Our Fragile Earth: Energy Efficiency and Renewables” video. Additional batteries should be provided in the trunk as back-up. The “At Watt Rate” activity may be removed, as it was a least popular activity in the trunk and many of the concepts are covered in the Cost of Using Energy and watt meter activities. One pilot teacher recommended adding a “potato clock” activity to the trunk, which she did with her students and had a great amount of success. Also, another pilot teacher recommended creating assessment questions to go with the videos to add to their learning value.

Energy Trunk evaluation

After revisions have been made to the trunk in line with the first recommendation, it is suggested that a summative evaluation be conducted to evaluate the improvements.

In addition, it is recommended that a follow-up test be given to the classes in the pilot study's experimental group, as this would help to demonstrate whether there is retention of positive knowledge and attitude change with respect to energy.

Also, ongoing evaluation should take place once the Energy Trunk program has been officially implemented, through teacher evaluation and possibly student evaluation.

Instruments used to assess the effectiveness of the trunk during the pilot study may be used for these assessments.

Pilot with non-KEEP teachers

The Energy Trunk was piloted only with teachers who have been through a KEEP course. It would be beneficial to pilot the trunk with teachers who have not been through a KEEP course before officially offering the trunk to non-KEEP teachers.

Energy Trunk Dissemination

An in depth dissemination strategy has been recommended for the Energy Trunks, as seen in review of Subproblem 4. Highlights of the recommendation include: 1) a combination of selling and loaning the trunks; 2) use of trunk A for

selling and trunks B and C for loaning; 3) a loan period of four weeks at a flat rate of \$150 to cover shipping and maintenance costs; and 4) advertisement of the trunk program through a newly created trunk brochure or flier, the KEEP website, conferences, and more.

Expand trunk program within KEEP

Results of the pilot indicated a great deal of success of this project from the perspective of both the teachers and students. If resources permit, it is recommended that the trunk program be expanded to focus on a first through fourth grade audience and/or, as one pilot teacher suggested, to facilitate teaching of other KEEP activities.

Summary of General Recommendations

Initiation of trunk programs outside KEEP

Positive findings of this study with respect to the Energy Trunk, as well as other trunk programs throughout the country, should encourage other EE and general education-related organizations to consider initiating trunk programs. Trunks have proven their ability to help meet certain educational objectives by:

- ❖ **Motivating and supporting educators in teaching a particular topic area.** An Energy Trunk pilot teacher (who had the KEEP Activity Guide) commented that he had not done any of the KEEP activities in his classroom *until* he used the Energy Trunk, which has five KEEP activities and corresponding resources.
- ❖ **Serving as a valuable teaching tool by providing a “ready to go” unit, which contains a plethora of resources and saves the teacher a great**

amount of time. Teachers from the Energy Trunk pilot, as well as those who have used trunks in other programs, express how wonderful it is to have the “supplies at their fingertips.”

- ❖ **Engaging students and improving the learning process.** The potential hands-on nature, and multiple learning style focus of trunks can make the learning process be more engaging for students.
- ❖ **Increasing awareness, knowledge and positive attitude goals for students.** Students exposed to the Energy Trunk during the pilot study increased their awareness, knowledge, and positive attitude towards energy significantly more than the students who were not exposed to the Energy Trunk.

Trunk program components

When considering the development of a trunk program, it is recommended that several areas be addressed. These areas include: 1) physical nature of the trunk, 2) contents, 3) budget, 4) piloting, 5) evaluation, 6) dissemination, and 7) maintenance. Different programs will have different objectives with respect to these seven areas; however, each should be reviewed to help ensure an effective program. In general, as far as trunk contents, a wide array of resources should be provided and an emphasis should be placed on hands-on items.

Conclusions and Implications

Energy has become a fundamental topic within Environmental Education. Everything we do on a daily basis is connected to energy, from our dependency on food, clothing, shelter, and transportation, to other components we often take for granted, like lighting.

Because of this dependency we have on energy it is vital to have an understanding of what it is, how we develop it, the effects of its development, and how we can manage it. This understanding is essential if we are to continue to meet a quality of life into the future.

KEEP has helped to meet this need of an energy literate citizenry through many programs and projects such as the KEEP graduate level courses, Activity Guide, website, newsletter, and more. Teachers expressed a need to KEEP for more resources to help them teach energy lessons and activities.

The Energy Education Resource Trunk is a resource that will help to effectively meet this need. Teachers often feel overwhelmed at all they are trying to teach and plan for their students. The trunk will save teachers time by providing an abundance of resources in an organized, sequential fashion. The resources and guide provided in the trunk will also increase teachers' comfort level for teaching about energy. Increasing teachers' comfort level in teaching about energy equates to a greater transfer of awareness and knowledge to the students, and hence a more energy literate citizenry.

In addition to the trunk serving as a useful teaching tool for teachers, it will also serve as an engaging mode of learning for students. Students respond better and retain more of what they learn when they are actively involved and engaged in the learning process. Activities within the trunk are varied to appeal to students of various learning styles and multiple intelligences. This approach to learning will help students to better understand how energy is connected to their lives and how they have the ability to make choices that positively affect the sustainability of our energy resources.

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APPENDIX A

Edgar Dale's Cone of Learning

Cone of Learning (Edgar Dale)

After 2 weeks
we tend to remember...

Nature of
Involvement

10% of what we read

20% of what we hear

30% of what we see

50% of what we
hear and see

70% of what
we say

90% of
what we
say and
do

Reading

Hearing Words

Looking at Pictures

Watching a Movie

Looking at an Exhibit

Watching a Demonstration

Seeing It Done on Location

Participating in a Discussion

Giving a Talk

Doing a Dramatic Presentation

Simulating the Real Experience

Doing the Real Thing

Verbal Receiving

Passive

Visual Receiving

Receiving/
Participating

Active

Doing

APPENDIX B
Trunk Programs

Trunk/Kit Name	Creator	Contact Name	Phone number	Address	Email/ Web
1) The Beach in a Box Traveling Trunk	Assateague National Seashore	Rachelle Daigneault (creator) Liz (very involved now)	410-641-1441 x231 x232 (Liz)	7206 National Lakeshore Lane Berlin, MD 21811	Rachelle_daigneault@nps.gov www.nps.gov/asis
2) Wolf Trunk and Prairie Trunk	National Wildlife Federation	Alana Groshong	1-800-247-7387 x6092	Reston, VA	groshong@nwf.org
3) Aquatic Exotic Educational Trunk	Adopt-A-Lake	Laura Felda	715-346-3366	Lake Mngt. CNR UW-Stevens Point	lfelda@uwsp.edu
4) Beaver Creek Nature Trail Wonder Walks Backpacks	Beaver Creek Reserve Nature Center	Rick Koziel	715-877-2212	Route 2 Fall Creek, WI 54742	bcr@beavercreekreserve.org
5) Wild About Elk Trunk	Rocky Mountain Elk Foundation	Jodi Bishop	1-800-225-5355 1-406-523-4500	2291 W. Broadway P.O. Box 8249 Missoula, MT 59807	Info@rmef.org www.rmef.org
6) 6 different "Kits": Botany, Weather, Geology Cultural History, Old Caves Crater, and a teaching trunk- "Liquid Treasure"	Resource Center For Environmental Education	Glo Edwards or Mary Balagna	928-779-1745	P.O. Box 3243 Flagstaff, AZ 86003	Glo_Edwards@msn.com

7) 11 different trunks (Bears; Dinosaurs; Frogs; Water;...)	Science Museum of Minnesota	Jim Heintzman, Coord. of Educational Materials	651-221-9413	120 Kellogg Blvd. St. Paul, MN 55102	jjheintz@smm.org www.sci.mus.mn.us/
8) Groundwater Simulation Display	UW- Stevens Point Groundwater Division	Chris Mechenich	715-346-4276	Groundwater office CNR, UWSP Stevens Point, WI 54481	cmecheni@uwsp.edu
9) Kaibab Killers, a kit on predators and the food web	USDA Forest Service, Kaibab N.F.	Sharon L. Waltrip	928-635-5646	742 S. Glover Rd. Williams, AZ 86046	Swaltrip/r3_kaibab@fs.fed.us
10) Loon trunk	Sigurd Olson Env. Institute (assoc. with Northland College)	Cory Counard	715-682-1220	Ashland, WI 54806	ccounard@northland.edu
11) The Case for Buying Recycled: Investigating the Fourth R	Illinois Dept. of Commerce and Community Affairs- Bureau of Energy and Recycling	Lynne Slightom Or Missy Olinger	217-558-4043 217-557-1681	620 East Adams St. Springfield, IL 62701	lslight@commerce.state.il.us molinger@commerce.state.il.us
12) Wild About Turkey Education Box	Scott Stankowski, Lincoln High School (Wisconsin Rapids) science teacher	Scott Stankowski	h - 715-345-9984 w - 715-423-1520	856 Oak Ridge Lane Stevens Point WI 54481	stankowssh@wrps.org

13) White-tailed Deer Trunk	WI DNR- Bureau of Wildlife Mngt.	Beth Mittermaire Or Mary Kay Salwey Or Carrie Morgan	608-685- 3744 608-267- 5239		www.dnr.state.wi.us/ salwem@dnr.state.wi.us morgac@dnr.state.wi.us
14) Zebra Mussel Mania Traveling Trunk	MIT Sea Grant	Brandy Moran, K-12 Education Coordinator	617-253- 5944	MIT Sea Grant College Program E38-300 292 Main Street Cambridge, MA 02139	bmmoran@mit.edu
15) Several Energy related trunks and kits	National Energy Education Development Project (NEED)	Martha Callan	1-800- 875-5029	8408 Kao Circle Manassas, VA 20110	mcallan@need.org www.need.org

APPENDIX C

Trunk Program Interview Questionnaire

Trunk Questionnaire

A. Basics

- What is the name of the kit?
- Why was a kit chosen to be developed?
- What were the objectives of the kit?
- What is the age range of your audience? And how did you choose your audience?

A. Physical Nature of the Trunk or Kit

- What sort of container do you use to hold the kit resources? Is it a plastic container, a box, or other?
- Where do you buy the containers and how much do they cost?
- What are the dimensions of the container?
- Did the containers hold up well to use and transportation?

B. Contents

- What items are in the kit?
- Did you find sources (e.g. websites, organizations, companies, etc.) that were especially helpful for obtaining general science related hands-on activities and items? If so, what are they?
- Have you found that certain items in the trunk are more popular than others? If so, which ones and why?

C. Budget

- How much did it cost to produce each kit (container and all encompassing items, etc.)?
- Are the kits rented or sold? And for how much if they are rented or sold?
- Do you make or lose money, or come out even, with your program?
- What is the total budget for the program?
- If you don't mind me asking, what are your budget categories for the kit program (e.g. kit supplies, personnel, maintenance, etc.) and how much is allotted to each?

D. Piloting

- Were the kits piloted? If so, how?
- What elements of piloting the kits went well, and what could have used improvement?

E. Evaluation

- Were the trunks evaluated? If so, how?
- Did you determine if the students learned the intended objectives of the trunk? If so, how?
- Did you assess teachers' attitudes toward the kit? If so, how?

- If you have an evaluation form(s) that was used, could you please fax or send me a copy? (fax #: 715-346-4698; email: ceste941@uwsp.edu)

F. Dissemination

- If the kits are rented, *how* are they rented? If they are sold, are they subsidized for teachers in some way (e.g. through grants)?
- How often are they rented or sold?
- How long can a teacher keep the kit?
- How are the kits marketed?
- How many kits do you have for this specific program?
- What is the total number of kits that have been rented or sold?
- Are there incentives for teachers to use the kit? If so, what are they?
- If you used incentives, did you find them effective? Why or why not?

G. Personnel and Maintenance

- How many individuals run the kit program?
- How are the kits maintained?

H. Other

- What aspects of your program are going well?

- What aspects of your program could be improved?
- What advice would you give to someone who was developing a new trunk/kit?
- Could you please send me a copy of any documentation that you used in your trunk program. I already mentioned evaluation forms, but any other forms you used in marketing, etc. would be very helpful (fax #: 715-346-4698; email: ceste941@uwsp.edu).
- Would you do it all over again? Do you enjoy the trunk program or do you think it is too time consuming or too much of a hassle?
- Do you know of other kit/trunk programs? If so, do you have contact information for them?

APPENDIX D

IRB Protocol for Trunk Program Interview Questionnaire

Amended

University of Wisconsin-Stevens Point
Institutional Review Board for the Protection of Human Subjects

Protocol for Original Submissions

A complete protocol must be submitted to the IRB for approval prior to the initiation of any investigations involving human subjects or human materials, including studies in the behavioral and social sciences.

Send: 10 copies of (1) the completed protocol; (2) project abstract; and (3) samples of informed consent forms to the IRB chairperson. PROTOCOLS LACKING ANY ONE OF THESE THREE ELEMENTS WILL NOT BE APPROVED. In addition, copies of questionnaires or interview questions MUST be attached.

PLEASE TYPE

Project Title: The Development, Evaluation, and Associated Strategy for Dissemination of an Energy Education Resource Trunk for Grades 5-8 in Wisconsin (thesis title)

Principal Investigator: Catherine Estes

Department: Natural Resources Rank: graduate student

Campus Mailing Address: KEEP, 403 Learning Resources Library

Telephone: x4320 E-mail address: ceste941@uwsp.edu

Faculty Sponsor (if required): Dennis Yockers
(Faculty sponsor required if investigator is below rank of instructor.)

Expected Starting Date: March 1, 2002 Expected Completion Date: March 15, 2002

Are you applying for funding of this research? Yes _____ No X _____

If yes, what agency? _____

Please indicate the categories of subjects to be included in this project. Please check all that apply.

- Normal adult volunteers
- Incarcerated individuals
- Pregnant women
- Minors (under 18 years of age)
- Mentally Disabled
- Other _____ (specify)

(Faculty Member) I have completed the "Human Subjects Protection Training" (available at <http://www.uwsp.edu/special/irb/start.htm>) and agree to accept responsibility for conducting or directing this research in accordance with the guidelines.

Dennis Yockers 2/26/02
(Signature of Faculty Member responsible for research)

(Department Chair or equivalent) I have reviewed this research proposal and, to the best of my knowledge, believe that it meets the ethical standards of the discipline.

Kandy Choyen
(Signature of Department Chair or equivalent)

***** Do not write below this line - for IRB use only *****

IRB approval Dennis Yockers Date 2/27/02
(Signature of IRB Chair)

Approval for this research expires one year from the above date.
If research is not completed by this date, a request for continuation must be filed and approved before continuing.

Revised form: January 2001

Proposal Abstract

Write a brief description of the purpose of the proposed research project. (100-200 words)

The purpose of this research is to gain information from existing trunk/kit programs that will lend support to the creation of a successful energy education trunk program for grades 5-8, which will be run by the Wisconsin K-12 Energy Education Program.

The researcher will call individuals from various environmental/science organizations, museums, etc. who have had experience developing a trunk program. Questions asked, over the phone, during the established interview time will focus only on their trunk/kit program. Questions will be asked under the following topic areas: Basics, Physical Nature of the Trunk/Kit, Content, Budget, Piloting, Evaluation, Dissemination, Personnel and Maintenance, and Other.

Please complete the following questions for all research.

1. Describe the characteristics of the subjects, including gender, age ranges, ethnic background, health/treatment status and approximate number.

The individuals will be both male and female. None will be under age 18. It is not known what their ethnic background is, nor their health/treatment status. This is irrelevant to the researcher's study. The researcher will be interviewing approximately 12-15 individuals.

2. Indicate how and where your subjects will be obtained. Describe the method you will use to contact subjects.

The interviewees will be obtained from personal knowledge, discussion with graduate committee members, and investigations into other trunk/kit programs via the web.

3. What are you going to ask your subjects to do (be explicit) and where will your interaction with the subjects take place?

Initial contact with subjects will take place over the phone. The researcher will explain the project that she is doing and that she would be interested in conducting an interview with them to learn from their trunk/kit programs. A date and time to conduct the interview will hopefully be arranged. She will also ask if a consent form can be faxed to them, and then faxed back to her with their signature.

The researcher will ask the subjects to answer questions regarding their trunk/kit programs in the topic areas mentioned previously (Basics, Physical Nature of the Trunk/Kit, Content, Budget, Piloting, Evaluation, Dissemination, Personnel and Maintenance, and Other). All interaction with the subjects will occur over the phone, email, and fax including times to arrange the interview and then actually conduct the interview. No interviews will take place in person. The interviewees will be asked for their consent in recording the interview (over the phone) so that the interviewer can go back after the interview and gain greater insight from the interviewees' responses.

4. Will deception be used in gathering data? Yes _____ No _____ If yes, describe and justify.

5. Are there any risks to subjects? Yes _____ No _____

If yes, describe the risks (consider physical, psychological, social, economic, and legal risks) and include this description on the informed consent form.

6. What safeguards will be provided for subjects in case of harm or distress? (Examples of safeguards include having a counselor/therapist on call, an emergency plan in place for seeking medical assistance, assuring editorial rights to data prior to publication or release where appropriate.)

N/A

7. What are the benefits of participation/involvement in this research to subjects? (Examples include obtaining knowledge of discipline, experiencing research in a discipline, obtaining course credit, getting paid, or contributing to general welfare/knowledge.) Be sure to include this description on the informed consent form.

Contributing to the creation of a successful trunk/kit program.

8. Will this research involve conducting surveys or interviews? Yes —X— No ———
If yes, please attach copies of all instruments or include a list of interview questions.

See attached from initial protocol.

9. If electronic equipment is used with subjects, it is the investigator's responsibility to determine that it is safe, either by virtue of his or her own experience or through consultation with qualified technical personnel. The investigator is further responsible for carrying out continuing safety checks, as appropriate, during the course of the research. If electronic equipment is used, have appropriate measures been taken to ensure safety?
Yes ——— No ———

N/A

10. During this research, what precautions will be taken to protect the identify of subjects and the confidentiality of the data?

If the interviewees wish to remain anonymous then the researcher will ensure that their personal information (name, contact information, etc.) is not associated with anything produced, published or reviewed with regard to the study.

11. Where will the data be kept throughout the course of the study? What provisions will be taken to keep it confidential or safe?

The data will be kept in the researcher's office, in files. The office is locked when it is not being used.

12. Describe the intended use of the data by yourself and others.

The researcher will learn from the interviewees' experience developing trunk programs. For example, she will learn which containers work well, which do not; the best process for piloting and evaluating the kits; etc. This will enable the researcher to be more knowledgeable and thus more likely to develop a successful kit program for the WI K-12 Energy Education Program.

13. Will the results of the study be published or presented in a public or professional setting?

Yes ——— No ———

If yes, what precautions will be taken to protect the identity of your participants? **State whether or not subjects will be identifiable directly or through identifying information linked to the subjects.**

The results will possibly be presented in a professional setting. If the subjects wish to be anonymous, then the researcher will simply identify the trunk program as "Trunk Program A," or something similar.

14. State how and where you will store the data upon completion of your study as well as who will have access to it? What will be done with audio/video data upon completion of the study?

The researcher will store the data in files and on my computer. If any of the interviewees choose to be anonymous then she will remove their name and contact information from the data upon completion of the study (if the data is still of use to KEEP or others). If the information is not needed for future purposes, then it will be recycled and/or destroyed.

The researcher will be recording the interviewees' responses (through a recorder connected to the phone) if they give permission to do so. This will enable the interviews to take up less of the interviewees' time and allow the researcher to go back and learn more from the interview than by simply jotting down notes. The audiotapes will most likely be taped over when the research project has been completed.

Informed Consent to Participate in Human Subject Research

Catherine Estes, graduate student with the Wisconsin K-12 Energy Education Program, a program of the Wisconsin Center for Environmental Education at the University of Wisconsin- Stevens Point, is conducting a study to determine how existing trunk/kit programs have been developed, piloted, evaluated, and disseminated. We would appreciate your participation in this study, as it will assist us in developing a successful energy education trunk for grades 5-8 in the state of Wisconsin.

As part of the study, Catherine would like to interview those individuals who have been instrumental in the development of existing trunk programs. During the scheduled interview she will ask questions regarding their trunk program, with respect to the following categories: Basics, Physical Nature of the Trunk/Kit, Content, Budget, Piloting, Evaluation, Dissemination, Personnel and Maintenance, and Other.

We do not anticipate the study will pose any risk to you, other than the inconvenience of the time required for the interview. We hope, however, that this will be an opportunity for you to share your knowledge and provide a positive contribution to the development of a successful education resource for teachers and students of grades 5-8.

If you choose to be an anonymous contributor, please let us know and your responses will be kept in confidence.

Once the study is completed, you may receive the results of the study. If you would like these results, or if you have any questions in the meantime, please contact:

Catherine Estes, graduate student
Wisconsin K-12 Energy Education program
WCEE, 403 LRC
University of Wisconsin – Stevens Point
Stevens Point, WI 54481
(715) 346-4320

If you have any complaints about your treatment as a participant in this study or believe that you have been harmed in some way by your participation, please call or write:

Dr. Sandra Holmes, Chair
Institutional Review Board for the Protection of Human Subjects
Department of Psychology
University of Wisconsin – Stevens Point
Stevens Point, WI 54481
(715) 346-3952

Although Dr. Holmes will ask your name, all complaints are kept in confidence.

I have received a complete explanation of the study and I agree to participate.

Name _____ Date _____
(Signature of subject)

This research project has been approved by the UWSP Institutional Review Board for the Protection of Human Subjects.

APPENDIX E

KEEP Adjunct Faculty 2001 Focus Group Questions

KEEP Adjunct Faculty Focus Group Questions Midwest Conference 2001

It has been suggested that the Wisconsin K-12 Energy Education Program could be enhanced through the creation and dissemination of resource kits or trunks, which may accompany activities in the KEEP Activity Guide.

A trunk is a mobile container that houses several hands-on resources to help individuals better understand a concept or issue.

It would be a great help to us if you would take a few minutes to answer the following questions. Thanks for your help!

- 1) Are you a teacher? If so, what grade do you teach?
- 2) Do you see a need for more hands-on resources, such as resource kits or trunks, in meeting the goals of energy education?
- 3) Have you had experience using trunks?
- 4) If you answered yes to the previous question, did you find that the trunk was effective in helping to meet goals of increased understanding and awareness with respect to a particular topic area?
- 5) What do you see as potential benefits to using trunks?
- 6) Do you see any potential weaknesses of using trunks in the classroom?
- 7) What grade levels and subjects (i.e. physical science, social studies, etc.) do you see fitting best with a trunk focusing on energy education and why?
- 8) Do you have ideas on specific items that could be included in the trunks?
- 9) Do you know of existing trunk programs? If so, what are they and do you have the name of the individual or organization that created it?

Thanks again! Your insights are much appreciated! ☺

APPENDIX F

KEEP Adjunct Faculty 2002 Spring Survey (trunk section)

Adjunct Faculty Survey: Energy Trunk Development

During the Adjunct Faculty meeting at the Midwest Conference in October 2001, we discussed the development of an energy trunk. You gave some very useful information and ideas. Below is an update on the trunk's progress. Please let us know if you support our decisions and if you have any other suggestions for its content and development.

Audience

Based on discussions with KEEP adjunct faculty, the results of course evaluations, and a review of the academic standards, the trunk will be geared toward a grades 5-8 audience. *If you have any thoughts regarding our choosing these grade levels, please share them below.*

KEEP Activities

We are planning on including resources for teachers to use the KEEP activities listed below (see your Activity Guide for descriptions and details on the back of this page). They were chosen because they will give students a good energy "story." Students will learn about energy sources, energy conversions, how energy behaves, energy usage and cost, and energy efficiency.

Where Does It Get Its Energy (we'll adapt for grades 5-8)

Station Break

Circuit Circus

At Watt Rate

The Cost of Using Energy

Diminishing Returns

Please give comments in support or criticism of the activities and energy concepts/themes chosen.

We may need to take out an activity and corresponding materials if space limitations become an issue for the trunk. If this were to be the case, which activity would you take out and why?

Pilot Testing

Do you know of Wisconsin grades 5-8 teachers who have participated in the KEEP course and who might be interested in piloting the trunk in the early Fall of 2002?

Name

Grade teaches

School

Phone # and/or email

KEEP Activity Description and Rationale for Its Inclusion in the Trunk

1. Where Does It Get Its Energy? This activity is designed for grades 3-5 and would need to be adapted for grades 5-8. Students learn about various types of energy sources used for their daily activities. The activity will include objects that represent different sources (piece of coal, container of oil, light bulb, bright picture of the sun, cup for filling with water, battery, etc.)
2. Station Break. Activity focuses on energy conversions. All materials for each station will be provided in the trunk.
3. Circuit Circus. Focuses on energy moving through circuits to create mechanical, light, etc. energy. Materials listed will be provided. Some alteration to the activity may be made to make it less maintenance heavy as a part of the trunk. Circuit labs and electricity discovery kits from NASCO will be reviewed as replacement components within the activity. The “energy ball” will also be included as a fun object for the students.
4. At Watt Rate. Overhead transparencies would be made for teachers and additional resources may be added to support this activity, including the “Simple Things You Can Do To Save Energy At Home” video and a Watt Meter to measure energy usage.
5. The Cost of Using Energy. Incandescent and CFL bulbs and master copies of tables, handouts, etc would be provided. Additional resources that may be provided to support this activity include: the video from the previous activity, “energy management in and around your school” poster, Sun Joule’s CD ROM, Conservation of Energy poster, and the hand cranked incandescent and CFL bulb comparison (takes up a fair amount of room but good interactive object that will most likely be in trunk).
6. Diminishing Returns. Incandescent and CFL bulbs from previous activity will be used in this one too. Other materials such as overhead transparencies and those needed for the relay will be included as well. Coal nuggets, and the hand cranked bulb comparison may be incorporated too.

APPENDIX G

Samples of Trunk Program Evaluation Forms for Teachers

Exploring Magnets

Evaluation Form

Please take a few minutes to evaluate this activity so that we can revise it to better meet your needs. Thank you.

State: _____ Grade Level: _____ Number of Students: _____

- | | | |
|--|-----|----|
| 1. Did you conduct the entire activity? | Yes | No |
| 2. Were the instructions clear and easy to follow? | Yes | No |
| 3. Did the activity meet your academic objectives? | Yes | No |
| 4. Was the activity age-appropriate? | Yes | No |
| 5. Were the allotted times sufficient to conduct the activity? | Yes | No |
| 6. Was the activity easy to use? | Yes | No |
| 7. Was the preparation time acceptable for the activity? | Yes | No |
| 8. Were the students interested and motivated? | Yes | No |
| 9. Was the energy content age-appropriate? | Yes | No |
| 10. Would you use the activity again? | Yes | No |

How would you rate the activity overall?

How would your students rate the activity overall?

What would make the activity more useful to you?

Other Comments:

Please fax or mail to:

The NEED Project
PO Box 10101
Manassas, VA 20108
FAX: 1-800-847-1820

Loon Box Evaluation

Name (optional):

School:

Grade Level:

Number of Students Served:

What activities in the Loon Box were most effective for your students?

What activities were least effective?

Did you have any problems with the activities or supplies in the box? Please explain.

Please describe whether the instructions and teacher manual for the loon box were effective.

On a scale of 1-10 please rate the Loon Box for use in your classroom.
(1 = poor, 5 = adequate, 10 = excellent)

Did you receive the Loon Box on time?

Was the fee charged for use of the box appropriate?

Was the shipping of the box a difficulty?

Would you use the box in the future?

Please return this form in the Loon Box. Thank you for your assistance in helping us to evaluate this educational tool.

BEACH-IN-A-BOX TRAVELING TRUNK EVALUATION



Assateague Island National Seashore
7206 National Seashore Lane
Berlin, MD 21811

Please help us improve our educational program with your comments.

What grade level do you teach?

Please indicate your level of agreement with each of these statements by circling the appropriate number.

	Strongly Agree			Strongly Disagree	
The materials in the trunk are easy to pack, unpack and use.	1	2	3	4	5
The trunk and lesson plans were helpful in teaching my class.	1	2	3	4	5
It was easy to incorporate the activities into a unit of study.	1	2	3	4	5
I plan to use elements of the traveling trunk for future classes.	1	2	3	4	5

Which activities and lesson plans did you find to be most effective?

On average, how much preparation time did you need for each activity?

Did you use materials from the trunk with lesson plans or activities from other sources?
If yes, which materials and how did you use them?

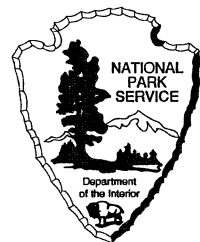
Are you planning follow-up activities for your class once the trunk has been returned?
Please describe.

What activities or lesson plans were least effective? What would you change or delete?

What materials, lesson plans, or activities would you like to see added to the traveling trunk?

Other comments or suggestions? Please feel free to include or attach information that describes how you changed lessons to suit your classroom needs.

Our "*sandcere*" thanks for your time.



APPENDIX H

Energy Trunk Evaluation Form for Teachers

Teacher Evaluation of Energy Trunk

Thank you for agreeing to pilot the trunk in your classroom and completing this evaluation form. Your honest feedback will help us to improve resources that will help teachers in their efforts to teach about energy!

Name (optional):

School (optional):

What grade level do you teach? · 5 6 7 8

Please indicate your level of agreement with each of these statements by circling the appropriate number. Comments are also appreciated.

	Strongly Agree				Strongly Disagree
The materials in the trunk were well organized.	1	2	3	4	5

Comments:

The materials were easy to unpack, use, and repack.	1	2	3	4	5
---	---	---	---	---	---

Comments:

The resource materials in the energy trunk covered appropriate concepts for my grade level.	1	2	3	4	5
---	---	---	---	---	---

Comments:

The energy trunk addressed appropriate academic standards for my grade level. 1 2 3 4 5

Comments (please give examples of standards if possible):

My students enjoyed using the trunk. 1 2 3 4 5

Comments:

The trunk improved my ability to teach about energy. 1 2 3 4 5

Comments:

The structure of the Energy Education Trunk Guide is well organized. 1 2 3 4 5

Comments:

The content of the Energy Education Trunk Guide is thorough. 1 2 3 4 5

Comments:

Part of this pilot includes piloting three different containers to serve as the "trunk." Many factors went into the trunk containers chosen, like "shippability", aesthetics, size, ease with which materials could be organized, etc. Please comment on the trunk container you received:

What activities and other trunk resources were most effective in helping students learn about energy, and why?

What activities and other trunk resources were least effective in helping students learn about energy, and why?

Did you exclude any activities or other resources when you were teaching from the trunk? If so, what and why?

Is two weeks an appropriate amount of time for using the energy trunk?

Would you use the energy trunk again in the future? Why or why not?

Do you think that a workshop should be a prerequisite for teachers who would like to use the trunk, or do you think that the Guide is enough?

(1 more question on back!)

Other comments or suggestions that you have about the trunk???

Please return this completed form, along with the student evaluation forms and pre/post test answer sheets, to the envelope in the trunk.

Thank you!!

APPENDIX I

KEEP Adjunct Faculty Members

FirstName	LastName	Affiliation	City
Nick	Baumgart	Florence High School	Florence
Terrie	Cooper	Door County Land Trust	Ellison Bay
Jack	Finger	Waukesha School District	Waukesha
Susan	Stein	UW-Madison	Madison
Al	Stenstrup	Department of Natural Resources	Madison
Dan	York	Energy Center of Wisconsin	Madison
Kelly	Zagrzebski	Wisconsin Public Service Corporation	Wausau
Don	Lutz	Marathon Middle School	Marathon City
Patrick W	Arndt	Berlin High School	Berlin
Dennis	Weibel	River Heights Elementary	Knapp
Pat	Marinac	Appleton School District	Iola
Floyd	Henschel	Former Middle School Teacher	Beaver Dam
Lynn	Rinderle	Fritche Middle School	Milwaukee
Tehri	Parker	Midwest Renewable Energy Assoc.	Custer
Jeanine	Staab	Medford School District	Medford
Steve	Knudsen	Newman High School	Wausau
Ann	Quale	Sturgeon Bay School District	Sturgeon Bay
Meta	Reigel	UW- Stevens Point	Stevens Point
Jim	Jenson	Madison Gas and Electric	Madison
Ron	Orman	We Energies	Milwaukee
Ted	May	Northland College	Ashland

APPENDIX J

Validity Panel Evaluation Packet for Student Pre/Posttest

Validity Panel Evaluation Packet

Instructions for Evaluation

Please review the items according to the following descriptors:
Scale: 1 = lowest rating, 5 = highest rating.

- Content Validity:** Does the question adequately address objectives within the energy trunk and KEEP activities?
- Readability:** Is the question clearly written, in a language that a fifth through eighth grade student should be able to understand?
- Accuracy:** Is there clearly a best answer to the question?
- Distracters:** Are the distracters plausible to a fifth through eighth grade student?

Comments would be greatly appreciated! Please provide suggestions, if you believe a revised or different item could better address the objectives of the five KEEP activities.

Thank you very much for your participation!

ITEM EVALUATION FORM

Name of Evaluator: _____

Item #1

Trunk or KEEP Activity that the item focuses on: *Energy Source Sample Box*

Content Validity

Readability

Accuracy

Distracters

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

*Comments:

Item #2

Trunk or KEEP Activity that the item focuses on: *Station Break*

Content Validity

Readability

Accuracy

Distracters

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

*Comments:

Item #3

Trunk or KEEP Activity that the item focuses on: *Station Break*

Content Validity	Readability	Accuracy	Distracters
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

*Comments:

Item #4

Trunk or KEEP Activity that the item focuses on: *Station Break*

Content Validity	Readability	Accuracy	Distracters
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

*Comments:

Item #5

Trunk or KEEP Activity that the item focuses on: *Circuit Circus*

Content Validity	Readability	Accuracy	Distracters
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

*Comments:

Item #6

Trunk or KEEP Activity that the item focuses on: *Circuit Circus*

Content Validity	Readability	Accuracy	Distracters
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

*Comments:

Item #7

Trunk or KEEP Activity that the item focuses on: *At Watt Rate*

Content Validity	Readability	Accuracy	Distracters
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

*Comments:

Item #8

Trunk or KEEP Activity that the item focuses on: *At Watt Rate*

Content Validity	Readability	Accuracy	Distracters
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

*Comments:

Item #9

Trunk or KEEP Activity that the item focuses on: *Diminishing Returns*

Content Validity	Readability	Accuracy	Distracters
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

*Comments:

Item #10

Trunk or KEEP Activity that the item focuses on: *Cost of Using Energy*

Content Validity	Readability	Accuracy	Distracters
1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

*Comments:

APPENDIX K

Energy Trunk Student Pre/Posttest

First Name: _____ Last Initial: _____

INSTRUCTIONS

Directions:

Mark your answers on the answer sheet, which your teacher will provide. Use a #2 pencil to darken the circle you choose. Do not make marks outside the circle. To begin, write in your **first name and last initial** in the space provided on the answer sheet and fill in the appropriate bubbles.

A correctly filled circle:

4 (A) (B) (●) (D) (E)

Incorrectly filled circles:

5 (A) (B) (◐) (D) (E)

6 (A) (B) (◑) (D) (E)

7 (A) (B) (◒) (D) (E)

Today you are going to take a short survey about what you know and think about energy. This will not be used for a grade in your class. There are two parts to the survey.

Part One asks about what you know. Choose the **best** answer for each question. Notice that there are four choices: A, B, C, and D.

Practice:

1. Pizza is a type of _____.

- A. Animal
- B. Food
- C. Pet
- D. Plant

1 (A) (B) (C) (D) (E)

2. Which of the following is a country?

- A. Alabama
- B. Berlin
- C. California
- D. Germany

2 (A) (B) (C) (D) (E)

Part Two asks you about what you think or do. There are five choices. There are no right or wrong answers.

- If you strongly agree with the statement..... fill in circle **A** (strongly agree)
- If you agree with the statement..... fill in circle **B** (agree)
- If you are undecided..... fill in circle **C** (undecided)
- If you disagree with the statement..... fill in circle **D** (disagree)
- If you strongly disagree with the statement..... fill in circle **E** (strongly disagree)

Practice:

1. I think bananas taste better than oranges.	1 (A) (B) (C) (D) (E)
2. I do my homework as soon as I get home from school.	2 (A) (B) (C) (D) (E)

PART ONE

Instructions for Part One: Read each question carefully. Fill in the circle on your answer sheet for the letter representing the best answer.

1) Which of the following is an energy source used to generate electricity for human use?

- a) Light bulbs
- b) Lightning
- c) Paper
- d) Wind

2) Coal and petroleum are examples of _____.

- a) Alternative sources of energy
- b) Fossil Fuels
- c) Recycled resources
- d) Renewable sources of energy

3) All of the following are forms of energy except:

- a) Charged
- b) Chemical
- c) Elastic
- d) Sound

4) Complete the following energy conversion for a battery-powered flashlight:

_____ energy → electrical energy → light energy

- a) Chemical
- b) Elastic
- c) Mechanical
- d) Sound

5) What form of energy is produced in all energy conversions?

- a) Elastic
- b) Gravitational
- c) Heat
- d) Mechanical

6) An electric current is made up of moving _____.

- a) Atoms
- b) Electrons
- c) Neutrons
- d) Protons

7) Current flows only when a(n) _____ exists.

- a) Closed Circuit
- b) Open Circuit
- c) Parallel Connection
- d) Series Connection

8) Which of the following is a correct statement?

- a) Voltage x Wattage = Current
- b) Wattage x Current = Voltage
- c) Amps x Current = Wattage
- d) Voltage x Current = Wattage

9) Which of the following increases efficiency?

- a) Driving less fuel-efficient cars
- b) Leaving lights and appliances on for a short time while not in use
- c) Replacing a compact fluorescent light bulb with an incandescent light bulb
- d) Replacing an incandescent light bulb with a compact fluorescent light bulb

10) When considering the cost of using energy for a product, two important things to think about are its retail cost and the _____.

- a) Amount of brightness it illuminates
- b) Amount of energy it uses until it's disposed
- c) Contribution to the health of the consumer
- d) Type of energy it uses over its lifetime

PART TWO

Instructions for Part Two: This section is about what you think and do. Be honest. There are no right or wrong answers. Fill in the circle on your answer sheet that is closest to what you think or do.

Strongly Agree (A)	Agree (B)	Undecided (C)	Disagree (D)	Strongly Disagree (E)
-----------------------	--------------	------------------	-----------------	--------------------------

11) I walk or ride my bike to places nearby instead of asking for a ride.

Strongly Agree (A)	Agree (B)	Undecided (C)	Disagree (D)	Strongly Disagree (E)
-----------------------	--------------	------------------	-----------------	--------------------------

12) I don't worry about turning out lights in the classroom because the school pays for electricity.

Strongly Agree (A)	Agree (B)	Undecided (C)	Disagree (D)	Strongly Disagree (E)
-----------------------	--------------	------------------	-----------------	--------------------------

13) Things I do don't have much effect on the energy use in my home.

Strongly Agree (A)	Agree (B)	Undecided (C)	Disagree (D)	Strongly Disagree (E)
-----------------------	--------------	------------------	-----------------	--------------------------

14) It makes me happy to learn new ways to save energy.

Strongly Agree (A)	Agree (B)	Undecided (C)	Disagree (D)	Strongly Disagree (E)
-----------------------	--------------	------------------	-----------------	--------------------------

15) I talk to my family about ways we can save energy in our home.

Strongly Agree (A)	Agree (B)	Undecided (C)	Disagree (D)	Strongly Disagree (E)
-----------------------	--------------	------------------	-----------------	--------------------------

APPENDIX L

Sample Trunk Program Evaluation Form for Students



EVALUATION FOR STUDENTS

Assateague Island National Seashore Beach-In-a-Box traveling trunk

Staff at Assateague Island National Seashore would like to hear what students have to say about our trunks. Please share your thoughts with us.

School: _____

Student Name: _____

Grade: _____

What did you think of this Trunk? Was the trunk fun? What lessons or activities did you do? What did you like the best and the least?

Please describe 3 things you learned from the Beach-In-a-Box trunk.

1. _____

2. _____

3. _____

Thank you. Return this evaluation to your teacher who will mail it to the park.

APPENDIX M

Energy Trunk Evaluation Form for Students



Student Evaluation of Energy Trunk

KEEP (Wisconsin K-12 Energy Education Program) would like to know what YOU think about the new Energy Trunk. We appreciate your feedback!

School:

Grade:

Overall, what did you think about the energy trunk?

What activities or items did you like best? Why?

What activities or items did you like least? Why?

Please describe 3 things that you learned from the Energy trunk?

1.

2.

3.

Thanks!

APPENDIX N

IRB Protocol and Letter to District Administrators for Energy Trunk Pilot

Protocol for Original Submissions

A complete protocol must be submitted to the IRB for approval prior to the initiation of any investigations involving human subjects or human materials, including studies in the behavioral and social sciences.

Send: 10 copies of (1) the completed protocol; (2) project abstract; and (3) samples of informed consent forms to the IRB chairperson. PROTOCOLS LACKING ANY ONE OF THESE THREE ELEMENTS WILL NOT BE APPROVED. In addition, copies of questionnaires or interview questions MUST be attached.

PLEASE TYPE

Project Title: Energy Trunk Pilot

Principal Investigator: Catherine Estes

Department: College of Natural Resources

Rank: Graduate Student

Campus Mailing Address: Catherine Estes, Grad Student, College of Natural Resources

Telephone: X4320

E-mail address: ceste941@uwsp.edu

Faculty Sponsor (if required): Dennis Yockers

(Faculty sponsor required if investigator is below rank of instructor.)

Expected Starting Date: October 1, 2002

Expected Completion Date: November 1, 2002

Are you applying for funding of this research? Yes _____ No X _____

If yes, what agency? _____

Please indicate the categories of subjects to be included in this project. Please check all that apply.

X Normal adult volunteers

X Minors (under 18 years of age)

_____ Incarcerated individuals

_____ Mentally Disabled

_____ Pregnant women

_____ Other _____ (specify)

(Faculty Member) I have completed the "Human Subjects Protection Training" (available at) and agree to accept responsibility for conducting or directing this research in accordance with the guidelines.

Dennis Yockers 9-3-02
(Signature of Faculty Member responsible for research)

(Department Chair or equivalent) I have reviewed this research proposal and, to the best of my knowledge, believe that it meets the ethical standards of the discipline.

Jandy Crayton 9/3/02
(Signature of Department Chair or equivalent)

***** Do not write below this line - for IRB use only *****

IRB approval

[Signature]
(Signature of IRB Chair)

Date

9/30/02

Approval for this research expires one year from the above date.

If research is not completed by this date, a request for continuation must be filed and approved before continuing.

Revised form: January 2001

Proposal Abstract

Write a brief description of the purpose of the proposed research project. (100-200 words)

The current study aims to pilot the effectiveness of the Wisconsin K-12 Energy Education Program's (KEEP) new Energy Trunk. Eight 5th-8th grade Wisconsin teachers, who have all participated in the KEEP graduate course administered through UW- Stevens Point, will pilot the trunk in their classroom during October, which is Energy Awareness month. The pilot consists of four main components, led by the teachers:

- 1) Administering a student pre and posttest
- 2) Conducting all activities (mostly from the KEEP Activity Guide) in the Energy Trunk
- 3) Completing an Energy Trunk evaluation form
- 4) Guiding students in completing an Energy Trunk evaluation form

In addition to the eight classes who will pilot the trunk as described above, there will also be eight classes who will only participate in the pre and posttest portion of the pilot.

The results of the pilot will be analyzed in November and December to help determine the strengths and weaknesses of the trunk. Any necessary changes will be made according to findings before a dissemination strategy for the Energy trunk will be put into place.

Please complete the following questions for all research.

1. Describe the characteristics of the subjects, including gender, age ranges, ethnic background, health/treatment status and approximate number.

Wisconsin fifth-eighth grade students and teachers. A total of sixteen classes will be involved in the pilot process.

2. Indicate how and where your subjects will be obtained. Describe the method you will use to contact subjects.

The subjects will be obtained through voluntary agreement by teachers, who have participated in the KEEP course. Participating teachers initially found out about the pilot at the Energy Fair in June, as well as through email contact by KEEP staff. Teachers are made aware of all components of the pilot process, before agreeing to pilot the trunk in their classroom.

3. What are you going to ask your subjects to do (be explicit) and where will your interaction with the subjects take place?

I will not be working with the subjects directly. The teachers will be piloting the trunk in the classrooms themselves. They will also be administering the pre and posttests and trunk evaluations.

4. Will deception be used in gathering data? Yes _____ No _____
If yes, describe and justify.

5. Are there any risks to subjects? Yes _____ No _____
If yes, describe the risks (consider physical, psychological, social, economic, and legal risks) and include this description on the informed consent form.

6. What safeguards will be provided for subjects in case of harm or distress? (Examples of safeguards include having a counselor/therapist on call, an emergency plan in place for seeking medical assistance, assuring editorial rights to data prior to publication or release where appropriate.)

The pilot will take place at the respective schools, so normal school policies will be followed in case of harm or distress.

7. What are the benefits of participation/involvement in this research to subjects? (Examples include obtaining knowledge of discipline, experiencing research in a discipline, obtaining course credit, getting paid, or contributing to general welfare/knowledge.) Be sure to include this description on the informed consent form.

Both students and teachers will improve their knowledge of energy. Teachers will receive stipends for their involvement, and will have the benefit of a support resource to help them teach about energy in the classroom. Students will benefit by having a fun and more hands-on component added to their curriculum.

8. Will this research involve conducting surveys or interviews? Yes No
If yes, please attach copies of all instruments or include a list of interview questions.

9. If electronic equipment is used with subjects, it is the investigator's responsibility to determine that it is safe, either by virtue of his or her own experience or through consultation with qualified technical personnel. The investigator is further responsible for carrying out continuing safety checks, as appropriate, during the course of the research. If electronic equipment is used, have appropriate measures been taken to ensure safety?
Yes No

N/A

10. During this research, what precautions will be taken to protect the identity of subjects and the confidentiality of the data?

Pre- and Posttests will be filled out with only first name and last initial of the student. Students will not be asked for their name on the "Student Evaluation of the Energy Trunk" form. Teachers will be given the option of giving their name and school on the "Teacher Evaluation of the Energy" Trunk form.

11. Where will the data be kept throughout the course of the study? What provisions will be taken to keep it confidential or safe?

The graduate student will be sole analyzer and holder of data. The data will be kept in a secure office.

12. Describe the intended use of the data by yourself and others.

The data will be used in the graduate student's thesis. She will analyze changes in student knowledge and attitudes, as well as assess the general appeal, usefulness, and effectiveness of the trunk in the classroom.

13. Will the results of the study be published or presented in a public or professional setting?
Yes No

If yes, what precautions will be taken to protect the identity of your participants? **State whether or not subjects will be identifiable directly or through identifying information linked to the subjects.**

Subjects will not be identifiable in any published documents.

14. State how and where you will store the data upon completion of your study as well as who will have access to it? What will be done with audio/video data upon completion of the study?

Upon completion of the study, only the data in the thesis (lacking any student and teacher identification) will be kept. Surveys and tests will be destroyed.

A completed protocol must include a copy of the Informed Consent Form or a statement as why individual consent forms will not be used.

Revised form: January 2001

CONSENT FORM
For Teachers Piloting the Energy Trunk

Explanation of Procedures: Catherine Estes, Graduate Student at the University of Wisconsin - Stevens Point, is conducting a study to determine the effectiveness, usefulness, and appeal of an Energy Trunk for fifth through eighth grade students and teachers. We would appreciate your participation in this study, as it will help us in making any necessary revisions before final dissemination of the trunk. In return for your participation, you will be receiving a stipend of \$200.

As part of this study, we would like you to complete the attached teacher survey, which will be used to assess the effectiveness and use of the Energy Trunk.

Additionally, your students are being asked to take a short pre- and post-trunk test and complete a very brief evaluation that will also be used for our assessment purposes. Student results will be kept anonymous in any reporting, and no identification will be made between individual students, schools, or districts.

Risk: We don't believe there is any risk, physical or social, to you by participating in this pilot process.

Safeguards: The information gathered will be kept completely anonymous. We will not release any information that would identify you.

Offer to answer inquiries: Once the study is completed, we would be glad to give you the results. In the meantime, if you have any questions, please ask us or contact:

Catherine Estes, Graduate Student
Wisconsin K-12 Energy Education Program
UW-SP
Stevens Point, WI 54481
(715) 346-4320
ceste941@uwsp.edu

Third party: If you have any complaints about your treatment as a participant in this study, please call or write:

Dr. Sandra Holmes, Chair
Institutional Review Board for the Protection of Human Subjects
Department of Psychology
University of Wisconsin - Stevens Point
Stevens Point, WI 54481
(715) 346-3952

Although Dr. Holmes will ask your name, all complaints are kept in confidence.

I have received a complete explanation of the study and agree to participate.

Name _____ Date _____

This research project has been approved by the UWSP Institutional Review Board for the Protection of Human Subjects.

CONSENT FORM
For Teachers giving only the pre/posttest

Explanation of Procedures: Catherine Estes, Graduate Student at the University of Wisconsin - Stevens Point, is conducting a study to determine the effectiveness, usefulness, and appeal of an Energy Trunk for fifth through eighth grade students and teachers. We would appreciate your participation in this study, as it will help us in making any necessary revisions before final dissemination of the trunk. In return for your participation, you will be receiving a stipend of \$50.

As part of this study, we would like you to administer a pre/post test to your students. The results will be used to assess, in part, the effectiveness of the energy trunk by comparing them to results from students who have taken the pre/posttests and have had exposure to the Energy Trunk. Student results will be kept anonymous in any reporting, and no identification will be made between individual students, schools, or districts.

Risk: We don't believe there is any risk, physical or social, to you by participating in this pilot process.

Safeguards: The information gathered will be kept completely anonymous. We will not release any information that would identify you.

Offer to answer inquiries: Once the study is completed, we would be glad to give you the results. In the meantime, if you have any questions, please ask us or contact:

Catherine Estes, Graduate Student
Wisconsin K-12 Energy Education Program
UW-SP
Stevens Point, WI 54481
(715) 346-4320
ceste941@uwsp.edu

Third party: If you have any complaints about your treatment as a participant in this study, please call or write:

Dr. Sandra Holmes, Chair
Institutional Review Board for the Protection of Human Subjects
Department of Psychology
University of Wisconsin - Stevens Point
Stevens Point, WI 54481
(715) 346-3952

Although Dr. Holmes will ask your name, all complaints are kept in confidence.

I have received a complete explanation of the study and agree to participate.

Name _____ Date _____

This research project has been approved by the UWSP Institutional Review Board for the Protection of Human Subjects.

REQUEST FOR WAIVER OF CONSENT FORM

Explanation of Procedures: Catherine Estes, Graduate Student at the University of Wisconsin - Stevens Point, is conducting a pilot study to determine the effectiveness of an Energy Trunk for fifth through eighth grade students in Wisconsin. Students will complete a pre- and post-trunk assessment of knowledge and attitudes and a very brief evaluation of the trunk. Teachers will complete a more in depth evaluation dealing with the appeal, usefulness, and effectiveness of the trunk in teaching about energy.

Request for *Student* Consent Waiver: As mentioned, students will complete a short pre- and posttest dealing with topics and issues covered in the Energy Trunk. The test is largely multiple-choice, and does not contain any items that are significantly different from any other given assessment they are asked to complete on a regular basis in the schools. We do not believe that our pre- or posttest (which are identical to each other) warrant special informed consent by students or parents. Furthermore, each teacher will be carrying out all activities in the trunk and administering both tests with their students.

In summary, we believe that our methods of evaluation for the Energy Trunk are consistent with what students would do on a regular basis as part of any instructional unit in their school and would like to request a waiver for the student consent form.

WCEE, LRC, UWSP
Stevens Point, WI 54481
phone: (715) 346-4320
fax: (715) 346-4698
email: ceste941@uwsp.edu
Web for WCEE:
<http://www.uwsp.edu/acad/wcee/>
Web for KEEP:
<http://www.energied.ecw.org>

**Wisconsin
K-12
Energy
Education
Program**

Fax

To: District Administrator	From: Catherine Estes, KEEP
Fax:	Pages: 2 including cover
Phone:	Date: Sept., 13, 2002
Re:	CC:

Dear District Administrator,

The purpose of this fax is to make you aware of an upcoming pilot project we plan to do at one of your schools. One teacher at your school has already planned to conduct the pilot in hi/r classroom. The Wisconsin K-12 Energy Education Program has developed a new Energy Trunk, and there are eight 5th-8th grade teachers in the state of Wisconsin who have volunteered to pilot the trunk in their classroom this October 2002.

The eight Wisconsin teachers are all aware of the steps in the pilot, but I wanted to just send you some information about it, and ask for your approval as well. **I have attached a sheet that I request you to fax back to me with your signature of approval.** There is additional information about the pilot on this sheet.

Thanks in advance for your expedient reply!

Sincerely,

Catherine Estes, Graduate Student
WI K-12 Energy Education Program

As District Administrator of _____ School District, I grant permission for teachers in my schools to conduct a pilot of the Wisconsin K-12 Energy Education Program's new Energy Trunk. I understand that there are eight 5th-8th grade teachers throughout the state of Wisconsin who will be leading all of the activities in the trunk and administering the pre/post tests and brief student evaluations of the trunk. I also understand that the Institutional Review Board at UW-SP has approved the pilot study and that classroom participation is voluntary.

Name _____ Date _____

Signature _____

**(Please fax this form to the WI K-12 Energy Education Program.
Attn: Catherine Estes 715-346-4698. Your timely response is most appreciated!)**

Background:

The Wisconsin K-12 Energy Education Program (KEEP), a program of the Wisconsin Center for Environmental Education and located at UW-SP, has developed a new Energy Trunk to support teachers in their efforts to teach about energy. The trunk is based on five activities from the KEEP Activity Guide, which has been given to over 1,600 Wisconsin teachers who have participated in the KEEP graduate course taught through UW-SP. Materials needed to conduct the five activities are provided in the trunk. In addition, many other hands-on and engaging resources are supplied in the trunk. Items include energy source samples, a watt meter, a radiometer, Bill Nye the Science Guy energy videos, and more.

Teachers who volunteered to participate in the pilot have all been through the KEEP graduate course at UW-SP. The pilot will take place in October, which is Energy Awareness month. There is no charge to the teachers or schools for use of the energy trunk during this pilot. The pre- and posttests are for program evaluation purposes only and students will remain anonymous.

For questions or more information please contact Catherine Estes at the address, phone, or e-mail below. (Email is the most expedient form of communication for me).

Catherine Estes, Graduate Student
Wisconsin K-12 Energy Education Program
403 LRC, University of Wisconsin--Stevens Point
Stevens Point, WI 54481
715-346-4320
ceste941@uwsp.edu

APPENDIX O

**Letters to Teachers in the Experimental and Control Groups of the Energy
Trunk Pilot Study**

KEEP



Wisconsin Center
for
Environmental
Education
&
Energy Center
of Wisconsin

Wisconsin K-12 Energy
Education Program

Learning Resource Center
University of Wisconsin
Stevens Point

Stevens Point, WI
54481-3897

Phone: (715) 346-4770

Fax: (715) 346-4698

E-mail: energy@uwsp.edu



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waste; chlorine free, acid-free, and processed with
environmentally-sound dyes.

October 4, 2002

Dear (names of Experimental Group Teachers),

Thank you very much for agreeing to participate in the Energy Education Trunk pilot!

In this envelope you will find enough copies of both the pre/posttest and scantron answer sheet for your students. In addition, there are trunk evaluation forms for the students to fill out after completing the posttest. And there is a trunk evaluation form for you, the teacher, to fill out. This is a very important part of the pilot so please fill out this form thoroughly.

Please administer the pretests within a day or two of receiving this packet. Please administer the posttests (which are exactly the same as the pretests) after completing the activities in the trunk (roughly two weeks later).

Please ensure that your students fill in their **first name and last name (or initial) EXACTLY the same way on both the pre and posttest scantron answer sheets**. If they are not filled in the same way it will make my job of comparing the results of roughly 900 tests very difficult.

Also, I would like to be able to compare the results based on grade level. **Since your students are eighth graders, please have your students write in a "8" and fill in the "8" bubble in the "A" column of the "Special Codes" section on the answer sheet.**

If they know their social security number, they can write it in, but it is not necessary as long as they write and fill in their name the same way on each answer sheet.

I do not need to receive the actual pre and posttests back. I only need you to send me back their answer sheets, evaluation forms, and your evaluation form. Please put these materials back in the same envelope that you received them. Please make sure that they are well protected so that the answer sheets do not get harmed when the trunk is shipped back.

Directions for completing the tests are written directly on the tests, but it may help if you read over them with your students. Please let them know that this is more of a survey than a test, that they will not be graded, and that it is expected that they might not know all of the answers (mention this during the pretest).

After the trunk and all other materials have been mailed back to me I will be arranging for the \$200 stipend to be sent to your requested address. Please do email me your social security number (if the check is being made out to you) if you have not already. This is needed in obtaining the stipend check from the University accounts office.

Please let me know if you have any questions. Email is the best way to reach me. My email address is ceste941@uwsp.edu. Otherwise, you can leave a message for me at 715-346-4320. **Again, thank you for your help!**

Sincerely,

Catherine Estes
WI K-12 Energy Education Program

KEEP



Wisconsin Center
for
Environmental
Education
&
Energy Center
of Wisconsin

Wisconsin K-12 Energy
Education Program

Learning Resource Center
University of Wisconsin -
Stevens Point

Stevens Point, WI
54481-3897

Phone: (715) 346-4770

Fax: (715) 346-4698

E-mail: energy@uwsp.edu



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environmentally sound dyes.

October 4, 2002

Dear (names of Control Group Teachers),

Thank you very much for agreeing to administer the pre and posttests to your students. Comparing these results with those of the students who have had exposure to the Energy Education Trunk will help us determine the impact of the trunk on student knowledge of and attitude towards energy.

In this envelope you will find enough copies of both the pre/posttest and scantron answer sheet for your students. Please administer the pretests within a day or two of receiving this packet. Please administer the posttests (which are exactly the same as the pretests) two weeks later.

Please ensure that your students fill in their **first name and last name (or initial) EXACTLY the same way on both the pre and posttest scantron answer sheets**. If they are not filled in the same way it will make my job of comparing the results of roughly 900 tests very difficult.

Also, I would like to be able to compare the results based on grade level. **Since your students are eighth graders, please have your students write in a "8" and fill in the "8" bubble in the "A" column of the "Special Codes" section on the answer sheet.**

If they know their social security number, they can write it in, but it is not necessary as long as they write and fill in their name the same way on each answer sheet.

I do not need to receive the actual pre and posttests back. I only need you to send me back their answer sheets, in the envelope provided. Please send all of the pre and posttests back to me as soon as possible after administering the posttests.

Directions for completing the tests are written directly on the tests, but it may help if you read over them with your students. Please let them know that this is more of a survey than a test, that they will not be graded, and that it is expected that they might not know all of the answers.

Please **do not** tell them that they will be taking this test again two weeks later, and please do not focus on energy activities during the two-week time span between the pre and posttests. Those two things could greatly alter the test results.

Please let me know if you have any questions. Email is the best way to reach me. My email address is ceste941@uwsp.edu. Otherwise, you can leave a message for me at 715-346-4320.

Again, thank you for your help! After all of the pre and posttests have been mailed back to me I will be arranging for the \$50 stipend to be sent to you. Please do email me your social security

number if you have not already. This is needed in obtaining the stipend check from the University accounts office. In addition, if you would like to use the Energy Trunk free of charge one time after it is complete this spring or summer, please let us know!

Sincerely,

Catherine Estes
WI K-12 Energy Education Program

APPENDIX P

Trunk Program Interview Questionnaire Results

Physical Nature of the Trunks or Kits

Trunk or Kit Program	Container	Dimensions	Source	Cost	Durability	Other info
Science Museum of Minnesota Trunks (11 different trunks: <i>Dinosaurs</i> , <i>Hmong History and Culture</i> , <i>Raptors</i> , etc.)	Pelican 1500 camera case with handles and wheels. Also, uses foam etc. to protect resources in trunk.	11"x 17.5" x 28"	Local camera stores or via the web	\$150 each when bought in bulk (10 or more)	"Indestructable," floats, locks tightly.	Use foam etc. to protect resources in trunks; Sometimes use Rubbermaid containers bought in bulk from Target.
Illinois Dept. of Commerce and Community Affairs- Bureau of Energy and Recycling- Recycling Education Unit: <i>The Case for Buying Recycled: Investigating the Fourth R</i>	Big plastic container with hinged lid and small holes on side that are secured with zip/cable ties (said looked at Rubbermaid conatainers but lids don't stay on well)	24"x 20" x 12" (with all materials inside they weigh about 20-30 pounds)	Septor Manufacturing Company (containers have recycled content)	\$18.00	Very good. Only one has broken.	Don't have any packing material (e.g. foam) to protect pieces except for a little bubble wrap around glass but are looking into getting it (said videos are especially fragile).
National Wildlife Federation: <i>Wolf Trunk and Prairie Trunk</i>	Sturdy trunk with twist locks and they put additonal padlock on for shipping. Has rollers and a handle that pops up (similar to traveller's suitcase). Also, has padding on inside of entire surface of trunk.	22"x 20" x 30"	information not accessible	information not accessible	Very good.	*Packaging takes up room (sometimes use bags or rubbermaid containers inside trunk to give more protection to some items).
Assateague National Seashore: <i>The Beach in a Box Travelling Trunk</i>	Big black plastic container with handles and wheels. Also, can put padlock on it. Weighs 42 pounds with all of the materials in it.	32"x 18" x 13"	Lowe's	\$30-40.00	Very good. Have had them for a few years and the first one just broke last week.	

Physical Nature of the Trunks or Kits

Beaver Creek Nature Center: <i>Wonder Walks</i> Backpacks (15 different ones: <i>Winter</i> , <i>Frogs</i> , etc.)	Backpacks	average size	Believes they were obtained through a catalogue.	information not accessible	Fine.	
Rocky Mountain Elk Foundation: <i>Wild About Elk Trunk</i>	Big plastic gray container	information not accessible	Hasn't bought them in a while so didn't know.	information not accessible	Very good.	
Scott Stankowski adapting National Wild Turkey Federation's: <i>Wild About Turkey Education Box</i>	Miniature version of a capture/release box for turkeys. Made out of waxed cardboard. Good container for topic of trunk!					
Sigurd Olson Environmental Institute: <i>The Loon Watch Activity Box</i> (created by Minnesota Zoo)	Big plastic container with handle.	2.5' x 1.5' x1' so all shipping is oversized. Weighs about 38 lbs.	information not accessible	information not accessible		
National Energy Education Development Project (NEED): has several energy related kits	Single-use recycled cardboard boxes	Depends. Sizes include 12"x 9"x 5" and 14"x 14"x 14"	Web or through local retail	\$.85-1.50 each	Fine, but they are not used for repeated shipping.	They reuse packing material, which includes bubble wrap, shredded paper, etc., to help protect items in the kit.

Contents

Trunk or Kit Program	Resources included	Any items more popular than others?	Other info
Science Museum of Minnesota Trunks (11 different trunks: <i>Dinosaurs</i> , <i>Hmong History and Culture</i> , <i>Raptors</i> , etc.)	Books, videos, posters, games, specimens, artifacts, audio tapes, teacher's guide.	3-D items are more popular with kids and teachers than just the educational material printed on paper.	Good to pick items that are durable and don't break so easily over time.
Illinois Dept. of Commerce and Community Affairs- Bureau of Energy and Recycling- Recycling Education Unit: <i>The Case for Buying Recycled: Investigating the Fourth R</i>	Videos ("Bullfrog is a good source"), informational folders, various items made from recycled glass, aluminum, paper, plastic, etc., such as tiles, t-shirts, flower pots, and more.	Items that are visual and relevant to the kids. "Weird and common items are good to have." Some specific popular items are kitty litter made out of newspaper and a tote bag made out of plastic bottles.	Try to get things donated or at a discount- "never hurts to ask;" Activities are correlated to Illinois State Standards; Might be a good idea to give teacher a sheet saying if you only have one day, do this..;" Boldly identify items that can be kept by teacher, if any; Put labels on items so easily identifiable; Most popular with 4th and 5th graders.
National Wildlife Federation: <i>Wolf Trunk</i> and <i>Prairie Trunk</i>	Books, videos, multimedia activities, pelts, skulls, other artifacts, etc.	Animal artifacts because are *unique* items. Videos are popular. Teachers like multimedia and other activities.	
Assateague National Seashore: <i>The Beach in a Box Traveling Trunk</i>	Books, videos, games, sand, shells, plastimounts, photo flash cards, puppets slides, journals, wind meters, UV meters, feathers, magnifying lenses, teacher guide with cross curriculum activities and overheads.	Beach bingo game (made with laminated Assateague beach bingo sheets for each student); shells, sand and other hands-on materials; ready made overheads and copied worksheets.	"Many schools don't have all of the seemingly basic materials, so it's good to provide them in a ready to go trunk."
Beaver Creek Nature Center: <i>Wonder Walks Backpacks</i> (15 different ones: <i>Winter</i> , <i>Frogs</i> , etc.)	Varies bag to bag but some include casts, molds, nets, viewing tube, magnifying glasses, books, tape recorders, and more.	Certain backpacks are more popular than others. Frog pack had items that mimicked the different frog calls, which were very popular.	

Contents

<p>Rocky Mountain Elk Foundation: <i>Wild About Elk Trunk</i></p>	<p>Shed antler (and horn from cow for comparison); hide of elk, deer, and mountain lion; skull of cow elk and replica skull of mountain lion; hooves of elk and deer; cassette tape of elk sounds; slides; transparencies; books, posters, videos, Wild About Elk Curriculum Guide.</p>	<p>Hands-on items (skulls, antlers, hooves, etc.) are more popular. Videos seem to be used quite a bit. Slides don't seem to be used as much.</p>	
<p>Scott Stankowski adapting National Wild Turkey Federation's: <i>Wild About Turkey Education Box</i></p>	<p>Bulletin board materials (geared for lower levels), posters, CD ROM which contains 6 Project Wild activities (K-6) and info about Wild Turkeys and general teaching tips for using the materials in the kit, folder with instructions, and additional lessons not on the CD ROM.</p>	<p>N/A yet.</p>	<p>Scott is adapting the Federation's Turkey Box for Wisconsin audiences. He is working on correlating the materials to state standards, and diversifying the materials by adding some resources/lessons.</p>
<p>Sigurd Olson Environmental Institute: <i>The Loon Watch Activity Box</i> (created by Minnesota Zoo)</p>	<p>Loon costume with wings, flippers, etc.; teacher-led activities about Loon legends, Loon economic value, and Loon aesthetic value; 9 Loon station activities (hands-on stations about Loon bones, beak, diet, nesting location, etc.)</p>	<p>Loon costume.</p>	
<p>National Energy Education Development Project (NEED): has several energy related kits</p>	<p>Depends on the kit. Some include thermometers, light meter, hygrometer, teacher's guide, and student guides. See attached sheet for description of some of the kits and their contents.</p>	<p>Not a particular item. But what is more popular is the "fun stuff" that engages the students.</p>	<p>**NASCO, Sargent Welch, and Frey Scientific are good sources for supplies." NASCO is their biggest supplier, but they tend to have to backorder items so it can be difficult if you need to order a lot regularly. Good source for radiometers is www.Tedcotoys.com. A case of 12 costs \$29.70. 1-800-654-6357.</p>

Budget

Trunk or Kit Program	Cost of each Kit	Program makes money?	Total budget for program	Other info
Science Museum of Minnesota Trunks (11 different trunks: <i>Dinosaurs</i> , <i>Hmong History and Culture</i> , <i>Raptors</i> , etc.)	\$20,000-\$25,000 for a set of ten trunks and materials.	Yes, slightly positive cash flow so can cover maintenance (and other) costs.	Not sure. Has small promotional and replacement budget and pays one part time person to handle logistics of program (there is also one volunteer who comes in once a week to help with trunk program).	*Good to have budget for producing several trunks so can accommodate busier times of the year. *Need money for obtaining back-up supplies.
Illinois Dept. of Commerce and Community Affairs- Bureau of Energy and Recycling- Recycling Education Unit: <i>The Case for Buying Recycled: Investigating the Fourth R</i>	\$200-300	No, since they don't charge when loaning.	Information not accessible	
National Wildlife Federation: <i>Wolf Trunk and Prairie Trunk</i>	about \$1,000	Maybe make a little off of the shipping now, but have not yet caught up with initial cost of creating trunks.	Information not accessible	
Assateague National Seashore: <i>The Beach in a Box Traveling Trunk</i>	Information not accessible	Lose a little because only charges small fee mostly for shipping, but have not had to replace many items which helps keeps costs low.	Had budget of \$5,000 for program but didn't cost that much because a lot of the materials were created in house or obtained from Assateague for free (e.g. sand, shells, etc.). If were to do all over again doesn't know that would create so many things in house because was very time consuming.	

Budget

Beaver Creek Nature Center: <i>Wonder Walks</i> Backpacks (15 different ones: <i>Winter</i> , <i>Frogs</i> , etc.)	\$100-200	N/A	Don't have. It is just incorporated into the total interpretive budget for the Center. They put about \$100/year into replacement of pack items.	They don't rent or sell the packs. Also, as a Nature Center they are providing a service for visitors- the program is an investment in the Center so it's not an issue of making money/losing money.
Rocky Mountain Elk Foundation: <i>Wild About Elk Trunk</i>	about \$800	Actually, lose a little bit because though many trunks were sold at cost, many were also given away free and some at half price when a grant was written.	Don't put them together anymore so don't have a budget, but when were creating them they developed about 10/year at a cost of about \$800-900 each.	They don't make them anymore but will help others if they want to create an elk trunk.
Scott Stankowski adapting National Wild Turkey Federation's: <i>Wild About Turkey Education Box</i>	about \$200	Probably will come out even since it is a not for profit organization creating the trunks for educational purposes.	Not sure. Staff at the Federation wrote a WEEB grant for the project but he is not aware of the budget specifics.	
Sigurd Olson Environmental Institute: <i>The Loon Watch Activity Box</i> (created by Minnesota Zoo)	about \$600 for the Loon box they bought and rent out.	A little since only bought one trunk that they rent out and since teachers pay for shipping. However, they only make a little because there are maintenance costs.	Not sure.	
National Energy Education Development Project (NEED): has several energy related kits	about \$150-\$400	Yes, some.	There is not a separate budget for the kit program. There is just one big materials budget for all of the materials that they produce.	

Piloting

Trunk or Kit Program	Piloted?	How?	Positive features of the trunk	What ideas for improvement came about?
Science Museum of Minnesota Trunks (11 different trunks: <i>Dinosaurs</i> , <i>Hmong History and Culture</i> , <i>Raptors</i> , etc.)	Yes	Has magnet school that they work with to get input from teachers and students. Teachers filled out evaluation.	Determined that most popular items were the unique objects and colorful photographs.	Decided not to use too many consumables with activities b/c if whole school uses trunk then it would be a logistical nightmare to prepare and replace supplies each time trunk shipped out.
Illinois Dept. of Commerce and Community Affairs- Bureau of Energy and Recycling- Recycling Education Unit: <i>The Case for Buying Recycled: Investigating the Fourth R</i>	No, though did have someone with teaching experience help develop the trunk so there was knowledge present of what might work well in the classroom.	N/A	N/A	N/A
National Wildlife Federation: <i>Wolf Trunk</i> and <i>Prairie Trunk</i>	Yes, originally did with a Buffalo trunk they produced out of one of the field offices. Piloted in local classrooms.	Information not accessible.	N/A	N/A
Assateague National Seashore: <i>The Beach in a Box Traveling Trunk</i>	Not formally, but did take version of the trunk as it was being developed to educators' workshops.	N/A	N/A	Some of the items and lessons in trunk came to be included from feedback from the educators.
Beaver Creek Nature Center: <i>Wonder Walks Backpacks</i> (15 different ones: <i>Winter</i> , <i>Frogs</i> , etc.)	No	N/A	N/A	N/A

Piloting

<p>Rocky Mountain Elk Foundation: <i>Wild About Elk Trunk</i></p>	<p>Somewhat.</p>	<p>Trunk out of New Mexico piloted a little (no details were given/known). Feedback was given to Foundation and they changed a few things about the trunk.</p>	<p>Does not have any details because it was done in 1994.</p>	<p>Again, specifics not known.</p>
<p>Scott Stankowski adapting National Wild Turkey Federation's: <i>Wild About Turkey Education Box</i></p>	<p>The Federation would like to pilot 200 of Scott's Wisconsin adapted trunk.</p>	<p>He has a panel of teachers who are helping him to write lessons which adapt the trunk for Wisconsin audiences. These teachers will be helping him to locate other teachers who will be willing to pilot the trunk.</p>	<p>N/A because the pilot has not taken place yet</p>	<p>N/A because the pilot has not taken place yet.</p>
<p>Sigurd Olson Environmental Institute: <i>The Loon Watch Activity Box</i> (created by Minnesota Zoo)</p>	<p>Information not accessible</p>	<p>Information not accessible.</p>	<p>Information not accessible</p>	<p>Information not accessible</p>
<p>National Energy Education Development Project (NEED): has several energy related kits</p>	<p>Yes</p>	<p>They have a group of teachers who make up their "Teacher Advisory Board" and pilot NEED's kits. They ask them to fill out an evaluation form. There is no set # of classrooms that they pilot each kit in, though they generally try to have 5 or 6 teachers pilot each one.</p>	<p>*Through pilot in classrooms, NEED was able to see differences in how kit was used in groups verses how individuals reacted to it (before piloting in classroom, developer of kits did get individual youth's reactions). *Teachers loved the hand-on components.</p>	<p>Some teachers used to a very controlled environment had a little difficulty with the open nature of the kits. Changes were not made in this regard (because "kits are meant to appeal to students learning through experience and having fun."); however, NEED does make clear the objectives of the activity and how they meet national standards which provides a certain amount of structure and control for the teacher.</p>

Evaluation

Trunk or Kit Program	Evaluated?	Teacher evaluation?	Student evaluation?	Send me copy of evaluation?	Feedback on Evaluation
Science Museum of Minnesota Trunks (11 different trunks: <i>Dinosaurs</i> , <i>Hmong History and Culture</i> , <i>Raptors</i> , etc.)	Yes	Yes, informal qualitative analysis via evaluation form accompanying trunk.	No (because informal supplementary resource rather than curriculum piece).	Yes	
Illinois Dept. of Commerce and Community Affairs- Bureau of Energy and Recycling- Recycling Education Unit: <i>The Case for Buying Recycled: Investigating the Fourth R</i>	Yes	Yes, informal qualitative analysis via evaluation form accompanying trunk.	No, but the teachers often talk about the students' reaction on their evaluation form... They say, "the students were excited, impressed..really like the hands-on and _____ video.."	Yes	*Suggested CD ROMS and books to include in trunk. *Said websites were great. *Told that highschool students take step further and look at economics etc.
National Wildlife Federation: <i>Wolf Trunk</i> and <i>Prairie Trunk</i>	No	N/A	N/A	N/A	But in talking to teachers gets "excellent feedback...every single one of them says it was a tremendous help."
Assateague National Seashore: <i>The Beach in a Box Traveling Trunk</i>	Yes	Yes, informal qualitative analysis via evaluation form accompanying trunk, but teachers rarely fill it out.	Yes, the students fill out an evaluation form. They also write about what they did with and learned and liked about the trunk in the journals that come with and are returned with the trunk.	Yes	Though teachers rarely fill out the evaluation form that accompanies trunk they seem to like it because they borrow it year after year.

Evaluation

<p>Beaver Creek Nature Center: <i>Wonder Walks Backpacks</i> (15 different ones: <i>Winter, Frogs, etc.</i>)</p>	<p>Yes, but it has been about 12 years since it was done so information not readily accessible. Had to do evaluation as part of the requirements of a grant they received.</p>	<p>When parents (or others) return backpack, they fill out a form with a checklist (to make sure everything is in the pack) and a comments section. Staff do an informal evaluation by looking at comments and which packs are checked out most often.</p>	<p>No</p>	<p>Yes, said he would send a copy.</p>	<p>Get a lot of positive comments from parents who check them out.</p>
<p>Rocky Mountain Elk Foundation: <i>Wild About Elk Trunk</i></p>	<p>Yes</p>	<p>Yes, teacher evaluation was put in trunk.</p>	<p>No</p>	<p>Yes, if she can find any.</p>	
<p>Scott Stankowski adapting National Wild Turkey Federation's: <i>Wild About Turkey Education Box</i></p>	<p>Yes, it will be.</p>	<p>After the pilot is done (2002-03), a questionnaire will be sent to the teachers who piloted the kit. They will return the forms to the panel of teachers Scott is working with. The panel will determine if adjustments need to be made.</p>	<p>No (except teachers may give their perspective on what students learned). This is believed to be sufficient in evaluating the kit.</p>	<p>N/A because it has not been developed yet.</p>	<p>N/A</p>
<p>Sigurd Olson Environmental Institute: <i>The Loon Watch Activity Box</i> (created by Minnesota Zoo)</p>	<p>Yes</p>	<p>Yes, teacher evaluation was put in trunk. (some questions asked about any problems incurred using the box and materials, about whether the box's instructions were clear, whether they would use the box again, whether the box was easy to use, etc.)</p>	<p>No, but questions were asked of the teachers on the evaluations about which activities were most and least effective with their students.</p>	<p>Yes</p>	<p>Not available.</p>

Evaluation

<p>National Energy Education Development Project (NEED): has several energy related kits</p>	<p>Yes</p>	<p>Yes, teachers are asked questions such as: Were the instructions clear? Was the activity age-appropriate? What would make the activity more useful to you?</p>	<p>No, but the teachers are asked questions focusing on the students such as: Were the students interested and motivated? How would your students rate the activity overall?</p>	<p>Yes</p>	<p>Most teachers love the kits overall. They like to have the hands-on items provided to them with the teacher background and activities. "Some teachers who prefer more control in the classroom had some trouble with the kits because they are somewhat open to help allow the students to become more engaged and have fun learning about science.</p>
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Dissemination

Kit Program	Rented? Sold? (how?)	How long can teacher keep kit?	How many kits in program?	Incentives for teacher to use kit?	How marketed?	Other info
Science Museum of Minnesota Trunks (11 different trunks: <i>Dinosaurs</i> , <i>Hmong</i> <i>History and</i> <i>Culture</i> , <i>Raptors</i> , etc.)	Rented, not sold. First come first serve. Teacher calls and trunk is delivered to their school. Teacher receives Operator's Manual in advance. Packing diagram inside lid of trunk. Checklist lists all items in trunk, and tells when trunk needs to be packed up and ready to be picked up. Commercial delivery picks up on designated date and returns to museum. Used to use UPS but had a lot of trouble with poor handling of their trunks so now use Spee Dee Delivery out of St. Cloud, MN.	However long they would like to keep it. One week- \$95 Two weeks- \$150 Additional weeks- \$50/week	Maximum of 10 trunks in each of the eleven topics (Museum has eleven different kinds of trunks).	Reduced rates and advanced notice of price increases are given to past customers.	*Marketed mostly to upper elementary and middle school students and teachers. *Advertised through museum's education catalogue which is sent to every school in MN and western WI and northern Iowa; displays at conferences; museum's website; brochure for outreach programs; and word of mouth. *Free trunks have been given away at workshops, etc.	

Dissemination

<p>Illinois Dept. of Commerce and Community Affairs- Bureau of Energy and Recycling- Recycling Education Unit: <i>The Case for Buying Recycled: Investigating the Fourth R</i></p>	<p>Loaned to teachers for free. Illinois Dept. of C & C also pays shipping costs to and from, and handles correspondence with shipper (they use UPS). Teacher only has to place trunk at pick-up location on designated day/time. Before getting trunk teachers fill out request form, where they agree to have trunk at pick-up location on designated day of return (teacher and principal are supposed to sign). Form says that if they don't follow mailing directions, will have to ship back overnight which costs about \$70... Also, says on agreement form that teacher agrees to fill out evaluation form. Evaluation form is put on bright colored paper. When calling UPS to have trunk picked up, a "call tag" is issued telling UPS where and when to pick up trunk. They have had problems with getting trunks back in a timely manner from UPS.</p>	<p>2 weeks- free</p>	<p>Twenty-five</p>	<p>Sometimes give teachers/classess pencils made out of recycled material and/or bookmarks- "10 good reasons to recycle" and "Ways to reduce your use"</p>	<p>*Marketed to K-12 (but most popular with 4th and 5th grades). *Advertised through quarterly newsletter and includes quotes from teachers who have used trunk and say, "The trunk was great because.."; work with recycling coordinators throughout the state so they know about them; work with PTAs, homeschoolers, other agencies like DNR and EPA; set up trunk at conferences; have a small engaging brochure about trunk that send out to teachers etc. *Other potential audiences: Scout groups, 4-H, women's groups, elderly.</p>	<p>Trunks are more popular at different times of year- Earth day, America Recycles Day, and Spring time in general- so good to have several trunks to meet demand. Summer is quiet time.</p>
<p>National Wildlife Federation: <i>Wolf Trunk and Prairie Trunk</i></p>	<p>Rented for \$50.00 (fee goes toward shipping). If trunk comes back missing items, loaner must pay for them to be replaced. Teacher fills out a request form. Use UPS for shipping. They too have had some trouble with UPS picking them up remotely and returning. Not sold.</p>	<p>3 weeks- \$50.00</p>	<p>Sixteen</p>	<p>No, demand is high so have not needed to use incentives.</p>	<p>*Marketed for elementary through junior high students (most of the users are 3rd-6th grade); *Advertised on website; *Word of mouth (with field coordinators, education staff, and those who've used the trunks) works well in advertising trunk.</p>	<p>*Overall "hardest part" of program. *Phone or email teachers reminder to have trunk ready at designated pick-up time. *Extend loan period when reaching more students or not a busy time.</p>

Dissemination

<p>Assateague National Seashore: <i>The Beach in a Box Traveling Trunk</i></p>	<p>Loaned to local teachers for \$10/week. Local teachers come and pick up and drop off trunks themselves. Teachers out of local area only have to pay shipping costs. Not sold.</p>	<p>Local teachers- \$10/week; Teachers out of local area-pay only cost of shipping.</p>	<p>Three</p>	<p>No, demand is high so have not needed to use incentives.</p>	<p>*Marketed to 1st-4th grade audience. *Do not do much advertising because already overbooked, but do have trunk fliers at the front desk of the Visitor Center.</p>	
<p>Beaver Creek Nature Center: <i>Wonder Walks Backpacks</i> (15 different ones: <i>Winter, Frogs, etc.</i>)</p>	<p>The packs are kept for visitors to the Center, and they are loaned out to local elementary teachers for free. The teachers come and pick up the packs and borrow them for about one week. Not sold.</p>	<p>Teachers can borrow for about a week- FREE</p>	<p>Fifteen different packs</p>	<p>N/A</p>	<p>*Marketed to ages 5-10 since most families visiting the Center have children that age. *Advertised through articles in their newsletter, brochure they send to all schools in area talking about the Nature Reserve various resources, and through CESA's.</p>	
<p>Rocky Mountain Elk Foundation: <i>Wild About Elk Trunk</i></p>	<p>Teachers in local area can come and check them out, but the Foundation does not ship out to teachers. They were being sold at cost (\$800) (see "other info"). If people could not afford the cost they could write a grant proposal and Elk Foundation would pay for half of cost.</p>	<p>They are flexible with the time they let local teachers borrow them (depending on demand).</p>	<p>Have put over 100 trunks together which have been disseminated to Project Wild/Fish and Game offices (who have their own dissemination strategies) and loaned to local teachers.</p>	<p>No, have not done this out of the Foundation but doesn't know if states have done anything.</p>	<p>*Marketed to grades K-12; for younger grades trunk is more discovery oriented- just looking at the objects. For the older grades, more of the activities are carried out, using the objects as support materials. *Advertisement of the trunk program differs at state level since being run by different Fish and Game offices.</p>	<p>First gave free trunks to Project Wild Coordinators (who generally work for Fish and Game agencies) across country as part of a grant that they gave to Project Wild to develop the curriculum for the trunk. Then they were sold.</p>

Dissemination

<p>Scott Stankowski adapting National Wild Turkey Federation's: <i>Wild About Turkey Education Box</i></p>	<p>After Scott finalizes the Wisconsin adapted kit, the Federation will distribute to the local chapters who will disseminate to local teachers. They may be sold to the chapters after the first one is given for free, but they will be given to teachers for free.</p>	<p>Teachers will keep the kit.</p>	<p>Have not made them yet.</p>	<p>Kit will be free for teachers.</p>	<p>*Kits marketed for K-12 audience *When the kits have been produced, there will be a workshop for the Wisconsin Society of Science Teachers so they can learn more about the kit.</p>	
<p>Sigurd Olson Environmental Institute: <i>The Loon Watch Activity Box</i> (created by Minnesota Zoo)</p>	<p>Yes. Rented for \$50/week plus the shipping cost. The teachers had to mail the trunk back and pay for insurance. Teachers first sent shipping agreement to sign.</p>	<p>About one to three weeks.</p>	<p>Sigurd Olson bought one trunk that they rented out to teachers.</p>	<p>N/A</p>	<p>*Kits marketed for elementary students mostly. *Advertise trunk through flier, Loon watch displays at programs, press releases, etc.</p>	<p>Didn't have much trouble getting trunk back on time-- "most likely because teachers had to pay a weekly fee."</p>
<p>National Energy Education Development Project (NEED): has several energy related kits</p>	<p>All kits are sold. Some are also rented. They use UPS for shipping and have had little trouble with them.</p>	<p>Those that are not sold are generally rented for three weeks.</p>	<p>About 10 different kits.</p>	<p>N/A</p>	<p>*Kits are marketed for a K-12 audience. Some kits focus on lower grade levels and some focus on upper grade levels. See attached sheet for grade level focus for six of the kits. *Advertise very little though do have resources displayed in their catalogue (but do not blindly mail out to teachers) and website. Also hold workshops for teachers to learn about kits, etc.</p>	

Maintenance

Trunk or Kit Program	How many personnel run program?	Maintenance issues
Science Museum of Minnesota Trunks (11 different trunks: <i>Dinosaurs</i> , <i>Hmong History and Culture</i> , <i>Raptors</i> , etc.)	One part time person and one volunteer who comes in once per week.	Cut back on consumables to make maintenance of trunk easier (especially when being sent to an entire school to use as opposed to one classroom).
Illinois Dept. of Commerce and Community Affairs- Bureau of Energy and Recycling- Recycling Education Unit: <i>The Case for Buying Recycled: Investigating the Fourth R</i>	One person. Initially, was <i>very</i> time consuming setting up the project (about 20 hours/week) but now spend about 5-10 hours per week updating the materials etc.	Not too bad. Has a checklist that is sent with trunk that teachers are supposed to fill out and check off to make sure all of the materials are back in the trunk before being returned.
National Wildlife Federation: <i>Wolf Trunk</i> and <i>Prairie Trunk</i>	One person, plus part of one other's time to work on budget for programs.	There's a fair amount of maintenance (couple of hours/week): inventoring items, keeping a date tracking system for sending out and retrieving trunks, and adding new materials.
Assateague National Seashore: <i>The Beach in a Box Traveling Trunk</i>	One staff person (about 1 hour/week now that trunks are completely put together), plus there are some volunteers who help with the check-in and out process.	No too bad because most of the time the trunks come back not missing many pieces.
Beaver Creek Nature Center: <i>Wonder Walks Backpacks</i> (15 different ones: <i>Winter</i> , <i>Frogs</i> , etc.)	One staff person checks packs in and out and makes sure that all of the materials are there when returned.	Once or twice a year all of the bags are gone through to make sure everything is in proper order.
Rocky Mountain Elk Foundation: <i>Wild About Elk Trunk</i>	One staff person.	Did have some trouble with the trunks not coming back with all of the materials at times. Did not ever charge the teachers a replacement fee.
Scott Stankowski adapting National Wild Turkey Federation's: <i>Wild About Turkey Education Box</i>	N/A yet.	N/A yet.
Sigurd Olson Environmental Institute: <i>The Loon Watch Activity Box</i> (created by Minnesota Zoo)	Two staff. One making sure all of the materials are maintained and updated, and one other who handled paper work and sending it out to teachers.	Some maintenance required when box is shipped back but not too bad.

Maintenance

National Energy Education Development Project (NEED): has several energy related kits	Two staff members basically run the kit program. One focuses more on the development side and one focuses more on the dissemination and maintenance components of the program.	Quite a lot of time is spent on maintenance, especially with the kits that are rented.
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Other - Advice, etc.

Kit Program	What aspects are going well?	What aspects could be improved?	Advice?	Do it all over again?
<p>Science Museum of Minnesota Trunks (11 different trunks: <i>Dinosaurs</i>, <i>Hmong History and Culture</i>, <i>Raptors</i>, etc.)</p>	<p>People like the convenience of the trunk program and 3-D objects in the trunk that help to support experiential learning. Have consistency throughout various trunks so if teacher has rented one of the 11 trunks they know what the others will contain.</p>	<p>Would like to have some lesson plans for each trunk that fit specific grade levels and national or state standards (but not too many lessons because too much paper will overwhelm the teacher and not be read).</p>	<p>"It's much more complicated than you think. It's not an easy or cheap way to do outreach. But it is a nice way to provide a resource. Ideally, you would want to do teacher training with the trunk..if they are very involved. The less written material, the better. Eight inch binder with tabs wont be read. Teachers are overwhelmed. We've tried to give them some really interesting useful things that help make their subject come alive."</p>	<p>**"Yes, they are incredibly fun to put together." **"Designing a trunk to tell somebody else about a topic is something that has been worked into our state standards because of our trunk. It's one of the options for one of the performance packages that teachers can choose." ***"We reach 70,000 kids a year."</p>
<p>Illinois Dept. of Commerce and Community Affairs- Bureau of Energy and Recycling- Recycling Education Unit: <i>The Case for Buying Recycled: Investigating the Fourth R</i></p>	<p>Overall it's a strong program.</p>	<p>*Working on a new educational activity manual. *Activity guide has a lot of crafts in it which middle school/older students don't like as much. *Have had trouble getting across to some groups that it is not too young for them.</p>	<p>*Do request letters with their understanding of mailing agreement, etc. *Do confirmation letters. *Have a big wall calendar with dates of when to ship out and when to pick up trunks. *Have variety of items in trunk. *Ask how teacher how they used the trunk in the evaluation form. *Tell teacher where to get free items. *Have everything labeled, including those things teachers can keep.</p>	<p>**"Yes, absolutely." "It's so exciting and fun!" *Now working on trying to do a vermicomposting case since the recycling one has worked so well.</p>
<p>National Wildlife Federation: <i>Wolf Trunk</i> and <i>Prairie Trunk</i></p>	<p>Educators love it (teachers tell her in informal conversations since don't have evaluation form).</p>	<p>Setting up the program to run more automatically so when the main person isn't there it still runs smoothly.</p>	<p>*Try and have maintenance of program set up in very clear process so that if someone else takes over it still runs smoothly. *Get teachers' feedback. *Make it a stand alone program.</p>	<p>"Absolutely! And we're trying to expand the program."</p>

Other - Advice, etc.

<p>Assateague National Seashore: <i>The Beach in a Box Traveling Trunk</i></p>	<p>The cross-curricular aspect of the lessons, because they reach out to all students, not just the "science-oriented" ones.</p>	<p>*More slides. *Better range of math lessons. *More accurate children's books. *Provide one book per student.</p>	<p>*Think about the time it will take to create the program and double it. *Think about the theme of the trunk and choose age appropriate materials. *Focus on limiting range of trunk materials and pick good, accurate, appropriate ones. *Choose as many hands-on materials as possible that are really age-appropriate.</p>	<p>"Yes!..Couldn't be happier that we have it!" *Won the Northeast Regional Award for Excellence in Interpretation- Media Award.</p>
<p>Beaver Creek Nature Center: <i>Wonder Walks Backpacks</i> (15 different ones: <i>Winter, Frogs, etc.</i>)</p>	<p>"Pretty much runs itself."</p>	<p>*May create a few more bags on different topics. *Market/advertise a little more to encourage more people to use them.</p>	<p>"Advertising/marketing is important so that people know about it."</p>	<p>"Yes, I think it has been a marvelous success- our Wonder Walks Bags. It really targeted an audience that we didn't have a lot of opportunities for...It was a way to get families involved in doing some hands-on things with their kids."</p>
<p>Rocky Mountain Elk Foundation: <i>Wild About Elk Trunk</i></p>	<p>Hands-on materials.</p>	<p>Budget is the main reason why they are not creating any more of them. Demand is also not very high anymore since have created over 100 that have been in use across the country.</p>	<p>Hands-on materials are great to have in the trunk.</p>	<p>"Yes, it was definitely positive."</p>
<p>Scott Stankowski adapting National Wild Turkey Federation's: <i>Wild About Turkey Education Box</i></p>	<p>N/A since adapted program not established yet.</p>	<p>N/A since adapted program not established yet.</p>	<p>*Make materials relevant to students. *Focus on visual, hands-on items. *Have an teacher evaluation form in the trunk.</p>	<p>N/A yet.</p>

Other - Advice, etc.

<p>Sigurd Olson Environmental Institute: <i>The Loon Watch Activity Box</i> (created by Minnesota Zoo)</p>	<p>Loon costume because it is so interactive with the students.</p>	<p>Some concern about the small pieces in the box that have to be maintained.</p>	<p>*For station activities, it is good to have laminated flip-up cards to identify stations. They have plexi glass holders for their cards and they have broken many times. *Using foam to create compartments for all of the pieces in the trunk is helpful. *Have check-off sheet with all trunk materials.</p>	<p>"Yes, I think this is a really good tool for elementary schools."</p>
<p>National Energy Education Development Project (NEED): has several energy related kits</p>	<p>"It all is. Teachers love them. It's very good to have activities in the experiemental design form (to have students predict, observe,...). Teachers are very glad to have the hands-on resources and receive background info. Teachers like that they are correlated to standards and that there are specific objectives and concepts covered."</p>	<p>Need to make sure that they have enough supplies on hand and work on finding more providers of supplies.</p>	<p>*Energy is mostly taught in grades 5-8-- it fits well with the nat'l/state standards at these grade levels. *Put multiples of resources in trunk or provide resources for stations so that all students can be as involved as possible. *Teachers don't always have a budget for a lot of copies so if you can make copies for students and in general make kit as ready-to-go as possible it is best. *Put background info in for teachers. *Get 5-10 teachers to give feedback on their needs. *Provide "lab rules" (lab safety guidelines & warnings for) for working with glass, batteries, etc. *Think in terms of two-grade level groupings (e.g. 3-4, 5-6, 7-8), to help meet needs of teachers. *About 2 weeks before sending trunk, send teacher book/guide to help get them psyched and prepared in planning for what is coming their way. *Be aware of time constraints of some cl</p>	<p>"It is a part of our core program-- our emphasis is hands-on science." She would prefer to be out of rentals though and just sell the kits. Renting is maintenance intensive (especially at their scale).</p>

APPENDIX Q

Wisconsin Science Standards Related to the Energy Trunk

Wisconsin State Science Standards Related to Energy Trunk

A. Science Connections

- ❖ *A.8.1 Develop their understanding of the science themes* by using the themes to frame questions about science-related issues and problems*
- ❖ *A.8.6 Use models* and explanations* to predict* actions and events in the natural world*
- ❖ *A.8.7 Design real or thought investigations* to test the usefulness and limitations of a model*

C. Science Inquiry

- ❖ *C.8.1 Identify* questions they can investigate* using resources and equipment they have available*
- ❖ *C.8.3 Design and safely conduct investigations* that provide reliable quantitative or qualitative data, as appropriate, to answer their questions*
- ❖ *C.8.5 Use accepted scientific knowledge, models*, and theories* to explain* their results and to raise further questions about their investigations*
- ❖ *C.8.7 Explain* their data and conclusions in ways that allow an audience to understand the questions they selected for investigation* and the answers they have developed*

D. Physical Science

- ❖ *D.8.4 While conducting investigations*, use the science themes* to develop explanations* of physical and chemical interactions* and energy* exchanges*
- ❖ *D.8.7 While conducting investigations* of common physical and chemical interactions* occurring in the laboratory and the outside world, use commonly accepted definitions of energy* and the idea of energy conservation*
- ❖ *D.8.9 Explain* the behaviors of various forms of energy* by using the models* of energy transmission, both in the laboratory and in real-life situations in the outside world*

F. Life and Environmental Science

- ❖ *F.8.8 Show* through investigations* how organisms both depend on and contribute to the balance or imbalance of populations and/or ecosystems, which in turn contribute to the total system* of life on the planet*

H. Science in Social and Personal Perspectives

- ❖ *H.8.2 Present a scientific solution to a problem involving the earth and space, life and environmental, or physical sciences and participate in a consensus-building discussion to arrive at a group decision*

APPENDIX R
Energy Resource Matrix

Energy Resource Matrix

<u>RESOURCE</u>	<u>SOURCE</u>	<u>COST</u>	<u>GRADE</u>
Solar Hydrogen Energy Kit- uses fuel cells and solar hyd. equip. to teach 25 prep lessons correlated to standards; focus on science and future technology	Carolina Biological Supply Co. - 1-800-222-7112; www.carolina.com	\$240	8th-12th
Transformation of Energy Apparatus- shows trans. f/ mechanical to electrical, heat, light, and sound energy. Instructions incl.	"	\$166	
SolarVerter 6-V Power Pack- weather resistant power pack w/ 6-V, 2,500-mA rechargeable battery. Operates any 6-V DC device..	"	\$49	
SolarVerter 9-V Solar Panel- can replace 6 D,C, AA, AAA batteries	"	\$128	
SolarVerter Science Teachers Instruction Kit- focuses on energy concepts and solar power. includes teach. manual, clear case radio, solar panels, volt/amp meter, Sun Joules CD-ROM, light bulb kit, and sample solar cell material	"	\$490	
Primary Science of Energy Kit- background and hands-on activities covering energy basics	NEED Project- 800-875-5029; need.org	\$300	k-4th
Science of Energy- hands-on; explore diff forms of energy and how transformed	"	\$400 (2 week rental- \$100)	4-8 or 7-12 (2 kits)
Energy Works Kit- background and hands-on; focus on motion, light, sound, heat, growth, and powering technology	"	\$400 (3 week rental- \$150)	3rd-8th
Heat Unit Kit- indiv. Unit from Energy Works Kit	"	\$100 (1 set)	3rd-8th
Motion Unit Kit- "	"	"	"
Light Unit Kit- "	"	"	"
Sound Unit Kit- "	"	"	"
Thermo Dynamics- guide to hands-on exper. explor molecular structure, conduction, convection, radiation, specific heat, heat of fusion, and heat of evap.; teacher's guide has demonstrations and list of materials needed and where to get	"	\$6	7-12th
Class set of student lab guides to go with above	"	\$60	"
Energy Infobooks	"	\$2.50-\$60	K-12
various energy activities	"	\$1-5	K-12
Electro Works Kit- hands-on explore atomic struct. and electricity; incl exper on static elec, batteries, electromagnetism, circuits	"	\$250-300 (2 week rental- \$100)	4-7th

Energy Resource Matrix

Building Buddies Kit- basic concepts of energy use and conservation, beg. w/ act. focused on home, then school; monitor outdoor weather conditions, record indoor and outdoor temps, and evaluate behaviors	"	\$175	K-3
Monitoring and Mentoring Kit- measuring energy use, determin. cost, look at env. effects; conduct surveys of school bldg and energy consumption; learn about gathering and analyzing data; encouraged to buddy with younger students to learn by teaching others	"	\$200	4-6th
Learning and Conserving Kit- gather and record data; dev energy plan for school games and icebreakers- entertaining way to intro energy, efficiency, and conserv; and reinforce info presented	"	\$225	7-12th
	"	\$3.50	K-12
Exploration: Solar Collectors- activity req. 4 plastic containers, black and white construction paper, water, thermometer, plastic wrap, rubber bands, scissors	"	~\$20 for materials; activity is in newsletter-free?	Elem
Solar Cooking (hot dog cooker)- activity req pringles potato chip can, scissors, wooden skewer, piece transparency film, hot dog, tape	"	"	Interm.
Science Project: Solar Distiller- (need 2 large plastic or glass containers, clear plastic wrap, masking tape, 2 small rocks, 2 small glasses, dirt, salt, water)	"	"	Interm.
Natural Refrigeration-- uses flower pots, thermometers, etc.	"	around \$40 for mater. (f/ newsletter)	Interm.
Solar Ovens made from pizza boxes	www.eecs.umich.edu/mathscience/funexperiements/agesubject/lessons/other/solar.html	around \$20 for materials	3 (?) and up
other solar cookers made from boxes	www.solarcooking.org	~\$30 for materials	3 (?) and up
Recreating the Greenhouse Effect activity- (need 2 glass jars, 4 cups cold water, 10 ice cubes, 1 clear plastic bag, a thermometer)	www.energy.ca.gov/education/projects/projects-html/greenhouse.html	~\$20 for materials	3-6th

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Peanut Power activity- potential energy activity	www.energy.ca.gov/education/projects/projects-html/peanut.html	~\$40 for materials	3-7th
Insulation: Keeping Heat In or Out activity- recording temps, graphing and interp data, drawing inferences, applying results to everyday sit.	www.energy.ca.gov/education/projects	~\$80 "	6-9th
Energy Sources activity- (need fruit/veg, pic of sun, veg. Oil, piece of firewood, piece of charcoal, container of motor oil, gas lighter, cup of water, empty cup, child's pinwheel,...	" (and have printed out)	~\$40 "	4-6th
How Much Energy Do You Use? activity (need calculator and	" "	/	3-6th
Home Energy Audit activity (need handouts, pencils, tape, tissue paper or thin plastic)	" "	~\$10	7-9th
Coal POSTER- This colorful poster describes the formation, exploration, extraction, transportation and use of coal. This is one of NEF's "Sources of Energy" posters. Its black and white reverse supplies background information and suggestions for student learning activities. Grades K-8, 23" x 35", Full Color, B/W back	National Energy Foundation; www.nef1.org ; 800-616-8326	\$4.95	K-8
Decision Making POSTER- A "decision making" process activity to arrive at and apply a management or use policy to "public" property. The subject land is a section of land in the Montana Overthrust Belt. A role-play simulation is outlined to consider a specific request to develop oil and gas reserves on the land. Grades 7-12, 23" x 35", Full Color, B/W back.	"	\$3.00	7-12th
Electrical Generation POSTER- This four-color poster shows the energy sources used to generate electricity (fossil fuels, nuclear, hydro and geothermal), as well as the transmission and distribution of electricity. Its black and white reverse supplies background information and suggestions for student learning activities. This is one of NEF's "Sources of Energy" posters. K-8, 23" x 35", Four Color, B/W back.	"	\$4.95	K-8
Electrical Safety in and Around the home POSTER- Helps any teacher instruct students in the vital subject of electrical safety. The materials on the back of the poster are designed so that a teacher can copy them for distribution to the class. They include basic electrical safety lesson plans, an electrical safety check list and other items which supplement the safety message illustrated by the poster. Grades K-5, 23" x 35", Full Color, B/W back.	"	\$4.95	K-5

Energy Resource Matrix

<p>Energy Eye Chart POSTER- A short, but to-the-point, energy conservation message is presented in the standard format of an eye chart. 17" x 11", B/W.</p>	<p style="text-align: center;">"</p>	<p style="text-align: center;">\$0.95</p>	<p style="text-align: center;">4-12th</p>
<p>Energy Mngt In and Around your School POSTER- More than mere eye appeal, the colors of this poster are symbolic. Each predominant color - brown, yellow, green, red, and blue - represents a type of energy or resource. The activities on the poster's reverse side correlate to the color coding and aid students in carrying out an energy audit of their school that leads to learning about operations and maintenance, energy conservation measures, and adaptations to renewable resources. Grades 5-10, 23" x 35", Full Color, B/W back.</p>	<p style="text-align: center;">"</p>	<p style="text-align: center;">\$4.95</p>	<p style="text-align: center;">5-10th</p>
<p>Fueling the Future POSTER- Can the increased adoption of alternative fuel vehicles, for personal use and in fleets, help the United States make progress in dealing with air quality problems and dependency on foreign oil? The new poster provides timely information about a variety of exciting transportation technologies, and the potential for these technologies to make a difference. Grades K-8</p>	<p style="text-align: center;">"</p>	<p style="text-align: center;">\$4.95</p>	<p style="text-align: center;">K-8</p>
<p>Natural Gas and the Environment- Cartoon styled POSTER depicting the contemporary relationships of the environment, social demands, and the positive aspects of natural gas as the most emission-free fossil fuel energy source. Its microcosmic community serves as a reference point for teaching environmental concepts. The black and white reverse side features six learning activities, each usable at many levels, and a reproducible black and white, line art miniature of the poster. Grades K-8, 23" x 35", Full Color, B/W back.</p>	<p style="text-align: center;">"</p>	<p style="text-align: center;">\$4.95</p>	<p style="text-align: center;">K-8</p>
<p>Sun's Joule's CD- interactive activities and video and audio clips, this multi-media program showcases global success in renewable energy and energy efficiency. Also included is the School Energy Doctor. This is a multi-media software program designed to help students learn about saving energy by performing an energy audit on their own school building. Grades 4-12</p>	<p style="text-align: center;">"</p>	<p style="text-align: center;">\$40</p>	<p style="text-align: center;">4-12th</p>

Energy Resource Matrix

Energy Action Patrol- NEF's student-led energy savings kit. Includes a comprehensive binder w/ guidelines, instructions, clipboard, thermometer, audit checklists, reminder notices, and an instructional video. Also include Energy Saver's Guides, and school-to-home Energy Action Challenges, as well as the Energy Action Activities guide, Energy Management poster, and School Energy Doctor software.	"	\$295	4-9th
Energy Tech and Society Kit- investig. energy concepts, tech, & social issues through the focus of renewable energy. Contains over 300 pages of background notes, learning activities, student work sheets and model plans for renewable energy projects. Also included are a videotape, the Sun's Joules/School Energy Doctor CD-ROM, and a set of energy posters and energists.	"	\$99.95	9-12th
Middle School Conserv. Kit- combination of NEF teacher's guides, posters, and take-home publications, intended for use by students, households, and teachers. Same as the Elementary School kit, with Energy Action Activities (5-9) instead of Energy Fun.	"	\$69.95	5-9th
Simple Things You Can Do To Save Energy At Home VIDEO- follows 12yr old on tour through house where light bulbs talk, an energy sucking beast lives in basement, and kids are blown away by hurricane force drafts. Teaches about energy use and provides conserv. tips	The Video Project: Media for a safe and sustainable world; 1-800-4-planet; www.videoproject.org/ <i>May be able to get cheaper through American Public Power Assoc.; 202-467-2900</i>	\$49.95; or \$89.00 with study guide	3rd and up
Simple Things You Can Do To Save Energy At School VIDEO- kids star in video and show how energy wasted in schools, and what students can do. Incl activity guide (has 8 experiments), a school energy audit form, etc.	"	" (or \$169 for set with guides; \$90 w/out)	3rd and up
Science Standards-based Energy POSTERS (Earth's Energy, Food Webs, Collisions, The Sun, Nutrition, Choices, Vibrations, Force and Motion, Transfer of Energy, Chemical Reactions)	National Science Teachers Association; 1-800-; www.nsta.org/scistore	\$9.50 each or \$65 for set	5th-12th
Energy Flow in a Wetland POSTER- board game format w/ rules, background, energy loss chart	"	\$5.50	3rd-6th ?
Middle Level Energy Series- BOOK focuses on energy production and consumption	"	\$9.95	7th-9th

Energy Resource Matrix

Awesome Experiments in Force and Motion- BOOK w/ experiments on force and motion. "fun-filled investigations." correlated to Nat'l Science Standards	"	\$17.95	5th-8th
Exploring Energy with Toys- BOOK	"	\$19.95	4th-8th
Energy Conservation- MODULE with Teacher Guide and Students Edition. Students explore sources, production, uses, and env. effects of energy; and apply learning by examining ways to improve energy efficiency of schools and homes.	Environmental Action (order through Dale Seymour publications- 1-800-872-1100)	Guides- \$13.95 for teacher; \$5.95 for student	4th-12th
Energy, Environment, and Development- BOOK about linkage b/t energy, env., and development	Island Press Environmental Sourcebook- 1-800-828-1302	\$23.00	9th-12th ?
Power Plant- VIDEO of tour through coal-based power plant; process of generating energy explained and concepts incl combustion, heat transfer, and condensation are presented; 31 minutes; quiz included.	Creative Educational Video; 1-800-922-9965	\$79.00	6th and up ?
The Canadian Renewable Energy Guide- BOOK that provides case studies of successful installations of solar, wind, biomass, hydro and other renewables.	General Store Publishing House; 1-800-465-6072	\$29.95	9th-12th
Early Warning Signs Curriculum Guide- developed to accompany "Global Warming: Early Signs" world map. Guide is aligned w/ National Learning Standards. Map can be viewed at www.climatehotmap.org	Developed by The Union of Concerned Scientists. Can be downloaded from www.climatehotmap.org/curriculum/index.html		9th-12th (but can be adapted for other grades)
Environmental Experiments About Renewable Energy- BOOK	Enslow Publishers, Inc.; 1-800-398-2504	\$16.95	
Conservation of Energy and Potential Energy VIDEO	Annenberg/CPB; 1-800-LEARNER	\$39.95 for both topics on one tape	
Earth's Limited Resources- VIDEO explores various resources used to provide energy	Earth Science & Geology; 1-877-301-3100; www.edudex.com	\$49.95	
Global Warming- VIDEO explains science and uncertainties behind global warming debates. Includes interviews with experts; 31 min.; has guide.	Hawkhill Wisconsin; 1-800-422-4295; www.hawkhill.com	\$86.00	secondary and college

Energy Resource Matrix

Energy on Earth- VIDEO explains basic laws of energy flow, importance of energy supplies for industrial societies, and new options; stresses imp. of research into alternatives, incl nuclear power, that do not add to global warming; 19 min.; has guide.	"	\$86.00	"
The Mystery of Electricity- VIDEO that explains three sides of electricity- as power, as information, and as the glue that holds things together.	"	"	"
Coal samples (and other coal materials)	American Coal Foundation; acf-coal@mindspring.com; 202-466-8630	free	
Energy music CD and dance VIDEO (to raise awareness and promote critical thinking about energy and society)	Project Learning Tree; info@plt.org; 202-463-2462		K-8
Simulated nuclear fuel pellet (and other nuclear energy info)	American Nuclear Society; outreach@ans.org; 708-352-6611	free?	
Wind energy info (basic facts, etc.)	American Wind Energy Association	free	
VIDEOS: Global Warming:Turning Up the Heat; How to Keep the Heat in Your House; Kilowatts from Cowpies; An Energy Future with a Future: Opening Your House to Solar Energy; Rising Waters: Global Warming and the Fate of the Pacific Islands; Turning Down the Heat: The New Energy Revolution; Energy Efficiency; Harness the Wind; An Energy Efficient Doghouse; Solar Energy Doghouse	Bullfrog Films; video@bullfrogfilms.com; 1-800-543-3764		
<i>Devoured by the Dark- Goosebumps</i> - like energy STORY exploring a travel through time adventure for children	California Energy Commission; www.energy.ca.gov/education; 916-654-4989		
Energy Conservation STICKERS	Local Utility OR Channing L. Bete Publishing Co., Inc.; 1-800-628-7733		K-4
Oil samples and other related oil materials (may have to go through training first to obtain materials)	Denver Earth Science Project; desp@mines.edu; 1-800-446-9488 x3621		4th-12th
Energy and Env. Skill builder Color BOOKLETS (could be good b/c probably aren't text heavy which is good for trunk)	Enterprise For Education, Inc.; entfored@aol.com; 310-394-9864; www.entfored.com	free ("from many utilities")	2-12th depending on subject/ booklet

Energy Resource Matrix

The Electric Vehicle Classroom Kit (contains 5-8 "Electric Flyer Model" Kits which have everything needed to build a working, table-top size model electric vehicle; classroom set of color booklets; and Teachers Electric Car Book	EV Media; 310-394-3980; ab50@aol.com		7th-12th
Fuel Cell facts etc.	Fuel Cells 2000; www.fuelcells.org; 202-785-4222	free	
Geothermal fact sheets, posters, booklets	Geothermal Education Office; geothermal.marin.org; 1-800-866-4436	free	4th-12th
Fusion: Creating a Star on Earth VIDEO; and "Starpower"- an interactive learning adventure CD	General Atomics Sciences Education Foundation; 858-455-3335; pat.winter@gat.com	requests or materials must be sent on school letterhead?	
Hydrogen Fact Sheets and brochure	National Hydrogen Association (NHA); nha@ttcorp.com; 202-223-5547		6th-12th
Hydropower POSTERS and other materials	The National Hydropower Association; info@hydro.org; 202-682-9478	"nominal cost"	
Nuclear energy facts, video, etc.	US DOE Office of Nuclear Energy, Science, and Technology	free	
Ethanol (clean-burning, renewable transportation fuel produced from agricultural feedstocks and wastes) general info	Renewable Fuels Association; 202-289-3835; www.ethanolRFA.org	free	
Alternative Fuels Booklet	San Diego Miramar College	free	
Solar info-- <i>Schools Going Solar, Volumes I & II</i> : a guide to schools enjoying the power of solar energy; "Solar Power-Making the Dream Real"- 10 min VIDEO	Solar Electric Power Association (SEPA); solarelectricpower@ttcorp.com; 202-857-0898	nominal cost	
Renewable Energy Fact Sheets	Solar Energy Industries Association; www.seia.org; 202-628-7979		5th-9th

Energy Resource Matrix

Biomass Fact Sheets	US DOE Bioenergy Feedstock Development Program; 865-576-5132	free	
***TONS of resources including (many actively involve students!!): many solar kits/games/objects; thermometers; energy bingo game; wires, batteries, lamps, battery holers, lamp holders; electricity kits; radiometers; energy ball; etc.	NASCO; www.enasco.com; 1-800-558-9595	varies	K-12th depending on resource
<i>Energy Education Resources</i> BOOK-- lists over 150 organizations who offer energy related materials. Some specifics are given on materials offered	US DOE Energy Information Administration, Nat'l Energy Information Center; 202-586-8800; www.eia.doe.gov/bookshelf/eer/kid/dietoc.html	free	K-12th
<i>Energy Stories</i> CD-ROM for Windows and Macintosh- "Showcases industries and businesses that have reduced energy use and waste. By walking through 'Elektra City', a stunning 3D town, you discover facts about energy efficiency and can read 27 stories featuring energy efficiency, renewable energy, and sustainable business practices. over 40 video and sound clips as well as 100s of colorful cahrts and graphs. Includes <i>School Energy Doctor</i> .	DOE and CREST- Center for Renewable Energy and Sustainable Technology		
Solar radio- BayGen Freeplay Radio. Can operate from spring wound dynamo (demonstrating conversion from potential to kinetic energy) or solar panel (demonstrating radiant energy being converted into electrical energy).	SOLutions; www.win.bright.net/~sunwise; 715-742-3406	\$70.00	All
Watts Up? Watt Meter and Teachers Guide. Used to measure energy usage of common household appliances.	Electronic Educational Devices; www.dbleed.com	\$100.00	

APPENDIX S

Energy Trunk Resources: Sources and Costs

Energy Trunk Resources: Sources and Costs

Energy Samples	Cost (not exact)	Source
Coal packets (peat, lignite, bituminous, anthracite)	\$2	American Coal Foundation (202-466-8630)
Oil (wrapped in bubble wrap)	\$5	Denver Earth Science Project, Colorado School of Mines (1-800-446-9488)
Simulated nuclear fuel pellet	\$1	Westinghouse Electric Co. (412-374-6803)
Wind/pinwheel	\$1	Fleet Farm
Photocell kit (contains paper directions, 1 photocell, 2 wire connectors with alligator clips, 1 motor, 1 propeller, 1 buzzer, 1 mini light bulb, and 1 mini light bulb socket)	\$52	NASCO (www.enasco.com ; 1-800-558-9595)

Videos	Cost (not exact)	Source
Bill Nye the Science Guy: Energy	\$30	Disney Educational Productions (1-800-295-5010)
Bill Nye the Science Guy: Electrical Current	\$30	"
Simple Things You Can Do To Save Energy in Your School	\$50	American Public Power Association (202-467-2900)
Our Fragile Earth: Energy Efficiency and Renewables	\$35	The Video Project (1-800-4-planet)

CD Rom	Cost (not exact)	Source
Energy & Environmental Issues	\$10	FSU's Energy and Environmental Alliance (DLaHart@admin.fsu.edu)

Posters (each with 2 clamps)	Cost (not exact)	Source
Fueling the Future	\$3.25	Nat'l Energy Foundation (1-800-616-8326)
Energy Management In and Around Your School	\$3.25	"
Renewable Energy Sources	\$3.25	"

Books/Booklets	Cost (not exact)	Source
Energy Education Resources	N/A	Energy Info Admin, DOE
Energy Saver's Guide	\$1	Nat'l Energy Foundation (1-800-616-8326)
Energy Glossary	\$6	"

Station Break Activity	Cost (not exact)	Source
Ball	\$1	Shopko
Flashlight	\$2	Goodwill or Shopko
10 Rubber bands of various thicknesses	\$1	Goodwill
Stopwatch	\$10	Shopko
7 laminated station break cards	\$1	UWSP Library lamination services
Radiometer	\$5	Tedco Toys (1-800-654-6357)
Hair dryer	\$12	Shopko and K-Mart
Small fold-up fan	\$1	
Battery operated toy	\$2	Goodwill and Shopko
Battery operated toy	\$2	"
Battery operated fan	\$2	"
3 Wind-up or pull back toys	\$3	"
2 party noisemakers	\$0.20	Dollar Discount Store (by East side Copps)
kazoo	\$2	Jim Laabs Music (on Main St. in Stevens Point)
sleighbell shaker	\$4	"
1 wooden instrument with 1 wooden tapper	\$7	"
shaker	\$7	"
Plug in item #1	\$2	Goodwill or Shopko
Plug in item #2	N/A- they provide	
Plug in item #3	"	

Circuit Circus Activity	Cost (not exact)	Source
12 laminated "E" squares	\$1	UWSP library lamination services
3 laminated "I am a battery" signs	\$1	I created and then laminated
1 laminated "I am a light bulb" sign	\$1	"
1 16' long piece of	\$1	Goodwill

string		
5 Electricity Discovery Kits (each with a double battery holder, 2 switches, 2 bulb holders, 2 bulbs, 5 wire connectors with alligator clips, and 2 "D" Cell batteries	\$100	NASCO (www.enasco.com ; 1-800-558-9595)
4 flashing smiley balls	\$16	"
Overhead transparency: <i>Diagram of a Series Circuit and Diagrams of Parallel Circuits</i>	\$0.10	I created

The Cost of Using Energy Activity **Cost** (not exact) **Source**

75 watt incandescent light bulb	\$0.50	K-Mart
20 watt compact fluorescent	\$5	"

At Watt Rate Activity **Cost** (not exact) **Source**

Overhead transparency: <i>Annual Energy Expenses for a typical Wisconsin household</i>	\$0.10	I created
Overhead transparency: <i>U.S. Electricity Consumption by End Use, 1993</i>	\$0.10	I created
Watts Up? Watt meter	\$85 (in bulk with our discount)	Electronic Educational Devices (1-877-928-8701) www.doubleed.com
Watts Up? Student Handbook	Comes with meter	"

Diminishing Returns **Cost** (not exact) **Source**

2 bulbs from Cost of Using Energy Activity	See above	K-Mart
Overheads: <i>Comparison of Efficiencies</i>	\$.10	I created
Overhead: <i>Calculating System Efficiencies</i>	"	"
Overhead: <i>Steps of the Relay Simulating Energy Conversion Process</i>	"	"
Overhead: <i>Converting Chemical Energy to Light Energy</i>	"	"
2 plastic containers with 1 hole in bottom	free	Collected yogurt and cottage cheese containers

2 plastic containers with holes covering 1/3 of the bottom	free	"
6 small paper cups	\$.50	K-Mart

Other	Cost (not exact)	Source
Downing Display Case for Trunk	\$250	Downing Display
Toolbox Trunk	\$60	Menards
Black and Brass Trunk	\$20	Shopko
Batteries	\$10	wherever
Guide materials	\$10	Staples, and other
Alcohol swabs	\$1	K-Mart
Padlock	\$1	Dollar Discount
Ziplock bags	\$2	Goodwill
Rubbermade containers	\$20	Fleet Farm
Labels	\$2	Staples

TOTAL COST PER TRUNK

Trunk A (Downing Display Trunk) = \$820

Trunk B (Toolbox Trunk) = \$620

Trunk C (Black and Brass Trunk) = \$580

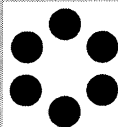
APPENDIX T

Energy Trunk Guide Materials

**Wisconsin K-12
Energy Education
Program's**

**Energy
Education
Trunk
Guide**

Sponsored by



focus on energy™

The power is within you.

KEEP



Wisconsin Center
for
Environmental
Education
&
Energy Center
of Wisconsin

Wisconsin K-12 Energy
Education Program

Learning Resource Center
University of Wisconsin -
Stevens Point

Stevens Point, WI
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Printed on paper recycled from 100% post-consumer
waste; chlorine free, acid-free, and processed with
environmentally-sound dyes.

Dear Teachers:

Welcome to the brand new ENERGY TRUNK! KEEP is excited to offer this resource to help you teach about energy. Energy can be a difficult concept for many students (and adults!) to understand. We believe that the trunk has a fairly complete set of engaging energy-related resources that will make learning about energy a little easier. This resource should give your students a good understanding of the importance of energy, where energy comes from, how energy is converted into different forms, how much energy is used by everyday appliances, how much energy costs, energy efficiency, and much more.

We would like to give you some helpful tips for using this trunk. The five KEEP activities that the trunk focuses on have been copied for you from the KEEP Activity Guide and placed in this Energy Trunk Guide. Some of the activities may refer to other parts of the KEEP Activity Guide so you may want to have it handy. However, it is not necessary that you have it to conduct the activities.

All overheads have been made for you and are located where they fall in the activity, in this Trunk Guide. When "copies of..." are referred to in the materials section of the activities, you will need to make the appropriate number of copies for your class.

Each of the four posters has information on the back that has been copied and placed in a section towards the back of the Guide. This information gives you the option of extending student involvement beyond just viewing the posters.

All of the items included in the trunk are listed at the front of the Guide. *Please go through the list and check off each item to make sure that nothing is missing before it is sent back to us.*

We hope that the trunk is an exciting and educational resource for both you and your students!

If you have any questions along the way, please feel free to contact me at ceste941@uwsp.edu or 715-346-4320.

Thank you for your enthusiasm for teaching about energy, and for helping us pilot KEEP's newest energy resource!

GOOD LUCK!

Catherine Estes

K-12 Energy Education Program

Suggested Sequence of Trunk Activities

The following list gives a suggested order for conducting the activities in the trunk. The items in **green** are the activities, which consist of actual activities taken from the KEEP Activity Guide, as well as videos, posters, energy source samples, and additional activities accompanying some of the resources. The items that you see in **orange** are items that you will need to supply. You will find everything else you need in the trunk. Also, don't forget, the overheads have been done for you and are in this guide, but you will need to make "copies" for your students when it is listed in the materials section of each KEEP activity.

- 1.) The activity we recommend starting out with is the **Bill Nye the Science Guy Energy video**. This will give your students a good (and entertaining!) introduction to what energy is, as well as what some different sources of energy are.
- 2.) A good follow up to this video would be letting your students look at and hold the different **energy source samples** in the trunk. The samples include coal, oil, a simulated nuclear pellet, a windmill pinwheel (representing wind energy) and a photocell kit (representing solar energy). Please do not let your students open the coal and oil samples. The photocell kit has directions with it that show you some basic activities you can do with your students to show them how electricity is generated from the sun. This is a quick and fun outdoor activity to do with your students on a sunny day.
- 3.) The *Energy* video is also good prep for the next activity we recommend doing with your students: the **Station Break activity**. The Station Break activity focuses on helping your students understand energy conversions and that heat is always produced during any energy conversion. **All station materials are provided, except for a battery-operated radio used in Station 2, those materials needed for Station 6, and plug-in items in Station 7.** Station 7 plug-in items can be those listed (e.g. hair dryer, fan, and pencil sharpener) or others that you have available that produce mechanical energy. One hair dryer has been provided for Station 1. You may try to have the it be shared by the two stations, though it may be easier to just bring in another one. Station 6's materials are peanut butter, jelly, bread, etc. You will need to supply these or may substitute them for apples, oranges, or other food items if you choose. Alcohol swabs have been

included to clean kazoos and party noisemakers after each use at Station 5. The seven station cards have been pre-cut, laminated, and included for you to use when you set up the stations in your classroom.

- 4.) The next activity suggested is showing the **Bill Nye the Science Guy *Electrical Current* video**. This is another fun, engaging Bill Nye video and will serve as a great introduction to the...
- 5.) ...**Circuit Circus activity**. This activity focuses on guiding students in understanding what an electrical circuit is, how an electrical circuit can be constructed, and what the difference is between parallel and series circuits. The basic materials for this activity have been provided. The 12 electron E squares have been cut and laminated. The student signs and a 16' long piece of string have also been provided. The materials "to be given to each group" are slightly different than what is listed in the materials section of the Circuit Circus activity. We found a great resource called the Electricity Discovery Kit, which has the bulbs, bulb holders, wire connectors, battery holders, and batteries needed to conduct a main portion of the Circuit Circus activity. The Discovery Kit also has two switches, which you may or may not decide to use (see Discovery Kit brochure for more information). We have decided to not include flashlights and extra wires for each group (used during the orientation segment of the activity) because each student group can instead explore what an electrical circuit is with the Discovery Kit. We also thought it was a safer set of materials for your students to work with. You can use the brochure that comes with the Discovery Kit for more activities to do with electrical circuits. Some of them require simple materials that you will surely have in your classroom, such as paper clips, erasers, and chalk. You may sum up this activity by passing around the...
- 6.) ...**smiley-faced flashing balls**. Have students play with them and discover that when they touch both metal strips on the balls they are completing an electrical circuit, which allows the flow of electrons to light up the ball and make a buzzing sound.
- 7.) Next, we suggest you do the **At Watt Rate?** activity with your students. This activity will show students how to calculate the energy use of various appliances in their homes, have them compare the amount of energy used by different appliances, and guide them in analyzing their energy use patterns and then suggesting ways that they could save energy. It is suggested that you give students a copy of the parental permission form (located in activity) soon after you get the trunk so that they have time to bring them back before you begin the activity.

- 8.) After finishing this activity, you may want to use the **Watt Meter** in the trunk to show your students how much wattage (power) some items in your classroom use. Opportunities for extension can be found in the Watt Meter student workbook in the trunk.
- 9.) After this activity, you may want to show your students the ***Simple Things You Can Do To Save Energy in Your School*** video and the **Energy Management In and Around Your School** poster.
- 10.) Next, we encourage you to do the **Cost of Using Energy** activity. By participating in this activity, students will be able to calculate the cost of energy used by different products and compare the costs of buying and operating lights and other appliances. A compact fluorescent bulb and an incandescent bulb of the same light output have been provided in the trunk.
- 11.) The final KEEP activity that the energy trunk focuses on is **Diminishing Returns**. Upon participating in this activity, students will gain a better understanding of the second law of thermodynamics through the conversion of chemical energy to light energy; calculate the system efficiency for different conversion processes; and compare the system efficiency of particular conversion devices and systems. Students will learn about the importance of system efficiency, as well as steps that they can take to contribute to greater energy efficiency. A 20-watt compact fluorescent bulb and a 75-watt incandescent bulb, referred to in the previous activity, can be used again in this activity. You are also provided with overheads, plastic containers, and small paper cups. **You will need to supply 3 one-gallon jugs and 2 lamps (to light each bulb).**
- 12.) Included in this trunk is a very interactive **CD ROM, entitled Energy & Environmental Issues**. It was developed for middle grade students and teachers. The funky music and six main areas (Great Energy Debate, Slide Show Maker, Energy Exploratorium, How Stuff Works, Energy Plant Tour, and Energy Activities) should be appealing to your students. Try to explore this CD with your students. If time does not permit you to go through it with your entire class try to have it as an option for students to explore on their own.
- 13.) Following this activity, you may want to wrap up with the energy trunk by showing your students the **Our Fragile Earth: Energy Efficiency and Renewables** video and **Renewable Energy Sources** and

Fueling the Future posters. These activities can spur on a wrap up discussion of the need for energy in our lives, and our role in supporting energy efficiency and the use of renewable sources for a sustainable future.

Have an *ELECTRIFYING* time!

A Few Reminders:



- ✓ Students should be encouraged to investigate the energy samples but please no taking out of/off of packaging (coal, oil, and nuclear pellet)!
- ✓ Photocells in photocell kits are delicate so please help them to stay scratch free! ☺
- ✓ It's best if you, the teacher, is in charge of taking things out of and putting things back in the trunk, to help prevent things getting lost.
- ✓ Speaking of things getting lost ☺, please make sure to check off all of the items on the "Energy Trunk Checklist," when packing it back up. The list is found in the front pocket of the Trunk Guide binder. If something has been lost or broken, please make a note of it and put it with the checked off list back in the Guide.
- ✓ Please keep all packaging material and repack the way it came to help items stay protected.

Energy Trunk Checklist

Energy Samples	Check
Coal packets (peat, lignite, bituminous, anthracite)	
Oil (wrapped in bubble wrap)	
Simulated nuclear fuel pellet	
Wind pinwheel	
Photocell kit (kit contains paper directions, 1 photocell, 2 wire connectors with alligator clips, 1 motor, 1 propeller, 1 buzzer, 1 mini light bulb, and 1 mini light bulb socket)	

Videos	Check
Bill Nye the Science Guy: Energy	
Bill Nye the Science Guy: Electrical Current	
Simple Things You Can Do To Save Energy In Your School	
Our Fragile Earth: Energy Efficiency and Renewables	

CD Rom	Check
Energy & Environmental Issues	

Posters (folded with 2 ideal clamps)	Check
Fueling the Future	
Energy Management In and Around Your School	
Renewable Energy Sources	

Books/Booklets	
Energy Education Resources	*You can
Energy Saver's Guide	KEEP
Energy Glossary	these*

Station Break Activity	Check
Ball	
Flashlight	
10 Rubber bands of various thickness	
Stopwatch	
7 laminated station break cards	
Radiometer	
Hair dryer	
Paper fan	
Battery operated object #1 (toy)	
Battery operated object #2 (toy or other)	
3 wind-up or pull back toys	
2 party noisemakers	
Kazoo	

Sleigh bell shaker	
1 wooden instrument with 1 wooden tapper	
Maraca or fruit shaker	

Circuit Circus Activity

Check

12 laminated "E" squares	
3 laminated "I am a battery" signs	
1 laminated "I am a light bulb" sign	
1 16' long piece of string	
5 Electricity Discovery Kits (each with a double battery holder, 2 switches, 2 bulb holders, 2 bulbs, 5 wire connectors with alligator clips, and 2 "D" Cell batteries)	
4 flashing smiley balls	
Overhead transparency: <i>Diagram of a Series Circuit and Diagrams of Parallel Circuits</i>	

The Cost of Using Energy Activity

Check

75 watt incandescent light bulb	
20 watt compact fluorescent	

At Watt Rate Activity

Check

Overhead transparency: <i>Annual Energy Expenses for a typical Wisconsin household</i>	
Overhead transparency: <i>U.S. Electricity Consumption by End Use, 1993</i>	
Watt meter	

Diminishing Returns

Check

2 bulbs from Cost of Using Energy Activity	
Overheads: <i>Comparison of Efficiencies</i>	
Overhead: <i>Calculating System Efficiencies</i>	
Overhead: <i>Steps of the Relay Simulating Energy Conversion Process</i>	
Overhead: <i>Converting Chemical Energy to Light Energy</i>	
3 plastic containers with 1 hole in bottom	
3 plastic containers with holes covering 1/3 of the bottom	
6 small paper cups	

Other

Check

Energy Trunk Guide and all encompassing materials! <ul style="list-style-type: none"> • "I am a light bulb/battery" signs (4) • Station break cards (7) • Overheads • Watts Up? Student workbook • Watts Up? Teacher's Guide copy • Sheets from each activity and poster • Checklist 	
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Additional Energy Trunk Guide Materials

- ❖ Copies of the five KEEP activities chosen for the Energy Trunk:
 - 1) *Station Break*: Students conduct simple investigations to identify different ways that energy conversions take place.
 - 2) *Circuit Circus*: Students construct and experiment with simple electrical circuits using batteries, wires, and bulbs.
 - 3) *At Watt Rate*: Students complete a survey to determine how various appliances in their home use electricity.
 - 4) *The Cost of Using Energy*: Students calculate the cost of energy used by various products found in the home and at school.
 - 5) *Diminishing Returns*: Students illustrate the concept of energy efficiency through a relay race.
- ❖ Overheads needed in the five KEEP activities
- ❖ Laminated Station Break cards and Circuit Circus signs
- ❖ Copies of the backs of the posters in the trunk (they contain additional activities)
- ❖ Watt Meter student and teacher guides

APPENDIX U

Samples of Trunk Rental Agreement Forms

Loon Box Reservation and Shipping Agreement

Agreement between LoonWatch, a program of the Sigurd Olson Environmental Institute (SOEI) at Northland College, and _____
for the loan of the Loon Box for the period from _____ to _____.

The Borrower agrees to pay the participation fee of \$50.00 per week as well as shipping costs (including \$1000 of insurance coverage) to return the Loon Box to LoonWatch (send by U.P.S., cost = approx. \$10.05, weight = 38 lbs.).

Special conditions, if any:

The Borrower agrees to sign this loan agreement and return it promptly to LoonWatch.

Borrower Contact Person:

_____ (Phone)

Shipping Address:

LoonWatch Contact Person:

_____ (715) 682-1220 (Phone)

NOTE: LoonWatch does not provide insurance for the Loon Box and packing cases during transit and display. For this reason, LoonWatch *requires* a certificate of insurance on the \$1000 cost of the exhibit during return (to LoonWatch) transit. The Borrower agrees to report immediately to LoonWatch any theft, loss, or damage occurring to the Loon Box while in their possession. Failure to do so will result in liability to the Borrower for any theft, loss, or damage that is not reimbursed by the insurer.

Signature: _____

LoonWatch, Sigurd Olson Environmental Institute, Northland College, Ashland, Wisconsin 54806.



**Science
Museum**
of Minnesota®

Trunk Rental Agreement

Confirmation Number:

Delivery Date:

Pickup Date:

Bill to:

Deliver To:

Site:

Phone:

Trunk(s) Reserved:

Program Title	# of Weeks	Fee

Rental Agreement:

Please read the *Program Information*, *Billing Information*, and *Trunk Reserved* information listed above and check for accuracy. Write corrections on this form and send to the School Outreach Department at the address listed below.

Your trunk is scheduled to be delivered by a shipping company on or before the arrival date listed. The same shipping company will automatically return for the trunk on the pickup date listed. Please have the trunk repacked and ready for pickup by noon that day. Additional repacking and pickup information will be included in the trunk.

Each trunk will be inspected before shipment from the Science Museum of Minnesota to ensure that all components are present and intact. Please inspect the contents of the trunk upon arrival and notify the School Outreach department within two days of any damaged or missing items to avoid charges for replacement or repair.

As the undersigned, you are accepting responsibility for the return of all items in the trunk, in the same condition in which they were received. Please sign and return this form to the address listed below. We recommend that you keep a copy for your records.

An invoice for will be sent to the billing address listed above after the trunk is returned to the Science Museum of Minnesota.

I agree to return all the materials in the trunk in the condition they were received.

Signature: _____ Date: _____

If you have any questions, please contact us at (651)221-4748 or (800)221-9444, extension 4748.

Please return to: Science Museum of Minnesota
Museum Trunk Program
School Outreach Department
120 West Kellogg Blvd.
St. Paul, MN 55102