



Energy Investigations for School Buildings

Objectives

By the end of this activity, students will be able to:

- analyze how their school uses energy efficiently and inefficiently; and
- develop a report that clearly and accurately presents the results of their analysis.

Rationale

Investigating an energy-related problem or issue within their school will help students examine current energy-use practices and evaluate how it affects school programming.

Materials

- The results of their school's energy audit (see **Getting Ready**)
- Paper, writing utensils, and other items students need to conduct investigation
- Copies of the following student pages:
 - **Investigation Planning Form**
 - **Investigation Reporting Form**
 - **Evaluation Criteria**

Background

With today's rising energy costs, people are taking steps at home to try to save energy and reduce their monthly utility bill. Schools too are realizing the effects of increasing energy expenses and its affect on their budget.

High energy costs, along with the effects of energy consumption, qualify as an environmental issue. With all environmental issues, there are factors that contribute to the creation of the issue and many perspectives related to the problem. It is important to investigate an issue prior to taking action to ensure the results of the action will be effective.

The same considerations hold true for taking action to save energy in your home or school. Although there are many simple ways to cut back on energy consumption and use it more efficiently, it is wise to examine how energy is being used and

how it is being wasted to ensure a more targeted approach to reducing energy usage. Similar to how a reporter or a detective will conduct research prior to making an assessment, energy advisors audit or investigate how energy flows through a building to help understand patterns and anomalies. Once the audit is completed the research is not done, however; the audit is a tool to help reveal problems and shortcomings. Additional investigations into the causes and sources of the problem facilitate identifying its solution. A careful and thoughtful investigation and analysis of energy usage will help ensure that actions taken to reduce energy consumption will be more effective.

Procedure

Orientation

Ask students to share reasons why they are asked to take tests in school. Ideally, how should the results of the tests be used? Discuss how tests help assess the current understandings students have about a topic; the results help teachers understand what areas their students need to learn more about. In other words, test results help identify areas that need attention or action.

Inform students that an energy audit of a school is somewhat like a test of the school. It helps identify where and how a school uses energy to help decide what actions should be taken to decrease the school's energy consumption.

Tell students that they are going to become investigative reporters. Their mission is to investigate how their school uses energy, and more importantly, identify areas where energy may be wasted or used inefficiently.

Steps

1. Share the results of an energy audit the students or energy professionals have conducted (see **Getting Ready**). As a class or with the help of a professional energy advisor, identify problem areas

Summary: Based on the analysis of a school's energy audit, students report where energy could be saved or used more efficiently.

This project can be assigned at the beginning, middle, or end of a unit related to effects of energy development and use. This project can also be the energy unit, where the investigation process is used by students to teach themselves and the class about energy-related issues. Students can be given class time to conduct research or be expected to do this on their own. In addition, students can gain knowledge and skills about effects of energy use and development through participating in class activities such as those found in this supplement.

Grade Level: 9–12 (5–8)

Subject Areas: Art, English Language Arts, Family and Consumer Science, Mathematics, Science, Technology Education

Setting: Classroom and school building

Time:

The time frame depends on when and how the project is implemented. The following is a possible timeline for the project.

Week One

Introduce assignment and have students plan their investigation.

Weeks Two and Three

Students conduct research (in and outside of class) and participate in class activities related to effects of energy use and development. Meet with students to discuss progress reports.

Week Four

Students prepare and turn in reports.

Major Concept Areas:

- Quality of life
- Quality of the environment

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Getting Ready:

This activity involves students analyzing the results of an energy audit. Students can conduct their own audit (Find worksheets and tools for conducting school building energy audits on keepprogram.org > Curriculum & Resources > Energy & Your School > Additional Resources) or your school administrator might have the results of an audit conducted by Focus on Energy or some other agency or local utility. If an audit is unavailable and there is not time to conduct one, invite your facilities manager into the class to discuss the school's energy use.

found by the audit. These are areas where energy is being wasted or could be used more efficiently.

2. Inform the class that although they can use the audit to identify problems, the audit might not tell why it is a problem, how it occurred, ways to solve the problem, or barriers to solving the problem. To really understand the problem, you need an investigation.
3. Discuss strategies commonly used to investigate a problem or issue. These include observations, interviews, reviewing historical data, and online and library searches of related information.
4. Divide the class into groups of three or four and provide each group with a copy of the **Investigation Planning Form**. Each group should identify one problem area to investigate. Following are a list of questions that can help them decide which area to investigate:
 - Which of the problem areas would be the most interesting to work on?
 - Which of the problems affect you

the most?

- Which area do you consider most important or needs immediate attention?
 - Which of the problems will you be able to influence the most?
5. After students identify which problem they plan to investigate, they should begin working on the rest of the **Investigation Planning Form**. They will add to and revise this form as they become more knowledgeable about the problem. When they develop their research question, encourage them to avoid simple yes/no responses and instead have questions that are supportive of an investigation. Share the evaluation criteria that will be used to assess the investigation to help students understand steps they should take in their analysis. NOTE: A set of **Evaluation Criteria** has been provided; adapt the criteria based on the expectations of the project as needed.
 6. Students can begin to conduct their investigation after they have completed their planning form and received your approval. Chances are students will spend much time outside of class conducting the investigation. Students can also be provided with lessons and activities related to their investigations. Class time is valuable to monitor students' progress and help with troubleshooting.

Closure

Have students use the **Investigation Reporting Form** to show the results of their investigation and analysis. You may wish to have students develop a more creative report. For example, they can pretend they are submitting an article for a popular news magazine. Students can also prepare a presentation and share their results to the principal, school board, community groups, and other interested organizations.

Assessment

Formative

- Did students work together cooperatively in groups?
- Do they know a variety of effects related to energy development and use?
- Did they use practical decision-making strategies to select an effect or issue?
- Was information in the report/presentation presented clearly and accurately?

Summative

- See **Evaluation Criteria** for investigating and reporting on an effect of energy resource development and use.
- Groups can evaluate the cooperation and responsibility of members.

Group Role Descriptions

To support a cooperative working group, have students assign members of their group to complete certain tasks. It may be helpful to classify tasks under different group role titles. Following are several possibilities:

Leader or facilitator: directs the group and makes sure tasks are completed

Researcher: locates and organizes information needed to complete the project

Planner or engineer: develops strategies for completing the project

Construction worker: builds, conducts, or takes necessary actions to complete the project

Recorder: takes notes or documents the group's progress

Public relations: communicates with the public, secures permission to conduct project, presents results of project

Investigation Planning Form

Group Members' Names

Responsibility

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

List at least three potential problem areas revealed through the energy audit.

Identify one of the areas you will investigate and write the research question(s) that will guide your investigation.

Before you begin your investigation, summarize what you currently know about this problem and indicate if any of this information comes from class activities.

What issues surround this problem? Summarize what you think are the differing viewpoints.

How do you plan to conduct the investigation? (Describe strategies you plan to use, such as library searches, Internet searches, emails to professionals, interviews, and surveys.)

Investigation Reporting Form

Group Members' Names

Responsibility

Title of Your Investigation

Research Question(s)

Background Information

(Attach additional pages as needed. Describe key points based on your literature review and other research strategies.)

Methods for Obtaining Firsthand Data

(Describe how you obtained data, such as interviews, surveys, opinionnaires, etc.)

Results

(Describe what you learned from your firsthand data.)

Conclusions

(Based on information compiled from Background and Results.)

Evaluation Criteria

for Investigation and Reporting on a School Building Energy Problem

Investigation and Report Title _____

Group Members' Names

Responsibility

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Evaluation criteria considerations for planning the investigation

Topic of investigation is problem identified through an energy audit	Strongly Agree	Agree	Disagree	Strongly Disagree
The research question provided guidance to the investigation	Strongly Agree	Agree	Disagree	Strongly Disagree
Approaches used to collect background information were effective	Strongly Agree	Agree	Disagree	Strongly Disagree
Practical strategies were used to collect first-hand (primary) data	Strongly Agree	Agree	Disagree	Strongly Disagree
A systematic approach was used to organize the researched information	Strongly Agree	Agree	Disagree	Strongly Disagree

Evaluation criteria considerations for reporting the results of the investigation

Background information is well written, thorough, and accurate	Strongly Agree	Agree	Disagree	Strongly Disagree
The results of the investigation are clearly written and well organized	Strongly Agree	Agree	Disagree	Strongly Disagree
Conclusions are accurate and logical and address the research question(s)	Strongly Agree	Agree	Disagree	Strongly Disagree

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