

Aktivität 2.3. Die Energieeffizienz

Cultural Background

2011 hat die deutsche Bundesregierung die sogenannte Energiewende beschlossen. Unter dem Begriff Energiewende versteht man einen alternativen, sauberen, bezahlbaren, sicheren – kurz nachhaltigen Weg, Energie zu erzeugen und zu nutzen. Das bedeutet Klimaschutz und die Abkehr von der traditioneller Strom- und Wärmeerzeugung vor allem durch Kohle- und Atomkraft. Und ein Hin zur Energieeffizienz und erneuerbaren Energien wie Photovoltaik, Windenergie und Wasserkraft. [Mittlerweile stammt fast ein Drittel des Stroms in Deutschland aus Wind, Sonne, Wasser oder Biomasse.](#)

Energieeffizienz ist ein Maß für den Aufwand (Verbrauch) von Energie zur Erreichung eines bestimmten Nutzens. Die Energiewende gelingt nur, wenn die Deutschen es gemeinsam schaffen, die Energieeffizienz zu steigern und ihren eigenen Energieverbrauch zu senken. - Die effizienteste und umweltschonendste Energie ist die, die man erst gar nicht verbraucht! Doch es gibt immer noch zahlreiche Hemmnisse, die der Steigerung der Energieeffizienz entgegenstehen.

In Waldsee

In Waldsee's STEM high school credit program, students explore how to make appliances or homes more energy efficient. They begin by investigating one of the small cabins on the village site that does not have insulation or indoor plumbing. They take a series of measurements, including surface area, dimensions, volume, interior and exterior temperatures, and a series of qualitative measurements, which will vary, to some degree, person by person (comfort in temperature/ambient noise/etc.) of the building, and track the internal and external temperatures multiples times per day, over the course of three days, in order to determine an average correlation between interior and exterior temperatures of the house. Next, they discuss and determine methods for improving temperature consistency and comfort throughout the day and night for the building, and offer three to five independent suggestions for remodelling/improvement. Finally, they create a to-scale representation of the building and test their various suggestions to determine which makes the greatest changes or improvements in temperature stability, noise reduction, and overall comfort.

In the Classroom

In this thematic unit, students use their German and science skills to explore how to make appliances or homes more energy efficient by comparing a traditional housing structure (type of insulation, heating units, window style, etc.) with equivalent homes that have purposefully integrated green appliances, or updated designs to maximize energy efficiency.

Objectives

- **Communication**
 - Students will use German language constructions and vocabulary to compare and contrast the relative energy efficiency of various appliances and homes.
 - Students will master subject-specific terminology and vocabulary and read, interpret, and solve a variety of energy-related questions in German.

- Students will determine methods for measuring various dimensions of energy use and energy efficiency.
 - Students will formulate questions and justify answers in German.
 - Students will explain a logical sequence of events and/or steps in order to conduct measurements and explain thinking.
 - Students will use if/then hypotheses and a series of inquiries.
 - Students will create, ask and answer questions.
 - Students will create and present summary of results, in 5+ sentences, both verbally and in writing in German.
- **Connections**
 - Students select their own remodel method, and explaining their reasoning for their given selection.
 - Students build further connection into their homes and lifestyles with their inquiry selection, generating, justifying and validating hypotheses, and investigating something that they simply find interesting.
 - Students will determine efficient improvements to save on energy consumption and encourage renewable energy usage.
 - Students further their understanding of cause and effect and methods through which to create sentences with both dependent and independent clauses, through their initial inquiries and explanations and justifications.
- **Cultures**
 - Students will learn about differing approaches to energy efficiency and energy use in the United States and in German-speaking Europe.
- **Comparisons**
 - Students will be able to use their German to compare and contrast different challenges to energy efficiency and discuss various hypotheses about the results.

Language Functions in Focus

- Understanding general vocabulary and technical language
- Indicating agreement and disagreement
- Explaining processes and procedures
- Inferring and interpreting data (verbally and in writing) in the target language
- Justifying an expressed opinion
- Comparing and contrasting
- Evaluating
- Suggesting
- Giving reasons and explaining causality
- Reporting

Materials

- Paper, straight edge, writing utensils
- Access to the internet, local energy usage information
- Data on typical energy improvements in homes, and suggestions for average cost savings
- Scientific and/or graphic calculators

Preparation

Students require general familiarity with energy sources, both renewable and non-renewable, and the ability to utilize one versus the other in their local area. They should be familiar with volume and surface area calculations, and measuring temperature on the Celsius scale. Students should understand the basic language surrounding numbers and simple mathematical operators.

Generating Interest

Begin by brainstorming all the ways in which energy is used in a home: heating, cooling, indoor plumbing, lighting, etc. Then, discuss what advantages exist in buildings that have easy access to these areas in a home, and compare them to natural methods. *Überlegt euch, was in eurem Haus Energie verbraucht? Herdplatte, Klimaanlage, Lichter und so weiter. Überlegt euch was die Vorteile sind, die der einfache Zugang in einem Haus bieten und vergleicht diese mit dem natürlichen Zugang zu Energiemethoden.*

- Is it better to have more lights in all rooms, or to have more windows to maximize natural light? *Ist es besser mehrere Lichter in allen Räumen zu haben, oder viele Fenster um mehr natürliches Licht zu nutzen.*
- Do you prefer to adjust the temperature (raise and lower) of a room/area on demand, or to have a consistent temperature throughout the day/year? *Ist es euch lieber die Temperatur nach Belieben verändern zu können oder wollt ihr lieber eine über den Tag/ über das Jahr konstant bleibende Temperatur?*
- Would you prefer to store massive quantities of heated water, just in case you need it, or to have water that heats when required, but takes a bit more time to get to where it is needed (via the installed pipes)? *Hättet ihr lieber die Möglichkeit große Massen an warmem Wasser zu lagern, oder lieber Wasser das warm wird, wenn ihr es braucht, auch wenn es etwas länger dauert, durch die Rohre bei euch anzukommen?*

Finally, lead into a discussion of which would require more energy over a set length of time, say a year. And how the requirements would differ, depending upon your geographic location. Then, introduce the idea of changing/installing/remodelling items or areas within their own homes, to the overall comfort and energy efficiency--what is already (energy) efficient? What could be improved upon? *Welche Variante verbraucht über ein Jahr mehr Energie? In wie fern beeinflusst die geographische Lage die Voraussetzungen für Häuser?*

Es gibt Möglichkeiten durch Umbauten oder Anbauten, die Energieeffizienz eurer eigenen Häuser zu steigern. Überlegt euch, was schon effizient ist und was noch effizienter werden könnte?

Presentation and Practice

Ask students to conduct research on a known housing structure. They should look at the type of insulation, heating units, window styles, etc. of the home. They should then look at an equivalent home that has purposefully integrated green appliances, or updated designs to maximize energy efficiency. Students can research general energy consumption rates and cost in their area (an example in Oregon: <https://www.portlandgeneral.com/our-company/pge-at-a-glance/quick-facts>) and compare them to averages for similar cost (in this case, electric consumption in a home) for homes that have solar-, wind-, or other alternative energy sources, and analyze the benefit to upgrading/remodeling homes. Additionally, students can explore the cost-benefit--if it costs \$x for installation and construction, and you save \$y per month, after how long will the cost of construction pay for itself in savings? By when will the homeowner come out ahead, for using more efficient

systems/installations? *Sucht euch Häuser/Gebäude aus und recherchiert wie diese isoliert sind, welche Heizkörper sie haben und was für Fenster eingebaut sind. Danach sucht ihr euch bitte ein vergleichbares Gebäude, mit energiesparenden Geräten oder energieeffizienten Designs. Informiert euch über die Energiekonsum Kosten in eurer Gegend und vergleicht die Kosten mit energieeffizienten Häusern, die alternative Energien nutzen. Ist es finanziell sinnvoll ein Haus aufzurüsten? Wie lange dauert es, bis sich die Investition auszahlt? Wann fängt man als Hausbesitzer an Geld zu sparen?*

This research-based end to the project lends itself to two basic overall methods: either the class all uses the the figures for average consumption in their area, and compares their individual research to that. Or, if parents are willing, students use the actual consumption for their home, kW/hr and annual cost, for their personal home. From there, each student would choose a specific aspect on which to focus--installing solar panels, for example--and basing their comparisons on the expected product and installation costs, and change in energy/consumption costs, to determine their final analysis.

Wortschatz

*die Energie
die Energiewende
die Effizienz
die Energieeffizienz
die Erhaltung
die Energieeinsparung
der Umbau
die Sanierung
recyclen
wiederverwerten
reduzieren
wiederverwenden
der Windschutz
die Isolierung
isolieren
einsparen
umfunktionieren
effizient*

*erfolgreich
retten
sparen
speichern
sichern
schützen
die Rohstoffquellen
die Betriebsmittel
die Ressourcen
die erneuerbare
Rohstoffe
die erneuerbare
Ressourcen
empfehlen
die Konstruktion
der Bau
die Bauarbeit
berechnen*

*rechnen
vergleichen
der Vorteil
der Nachteil
gut
besser
schlecht
schlechter
nachhaltig
langfristig
kurzfristig
zuerst
danach
als nächstes
später
zuletzt
schließlich*