



# CONCORDIA LANGUAGE VILLAGES

## Environmental Immersion – Experiencing Renewable Energy, Hands-on

Bring your science class/environmental study group or club to the unique *BioHaus* Environmental Living Center for a full day of hands-on science activities working with renewable energy systems, such as wind generators, solar photovoltaic, solar hot water and fuel cell systems. This educational program for 7<sup>th</sup>-9<sup>th</sup> graders was developed with the support of the University of Minnesota's Clean Energy Resource Team (CERT's) to promote science education with a strong emphasis on renewable energy. Being experts in the field of immersion learning we applied our knowledge to the development of new, experiential science activities at the *BioHaus*, an environmental living center in which the students live, study and interact while being immersed in cutting-edge, sustainable building design and technology.

Over 100 students from five different schools participated in the pilot program in the fall of 2008. Here is what some students and teachers had to say:

7<sup>th</sup>-8<sup>th</sup> grade science teacher, St. Marks School: "The hands-on experiments with the solar hot water system and the wind generator were most useful for the students because it gave them the opportunity to truly experience the experimental process.

8<sup>th</sup> grade science teacher, St. Philips School: "Designing and testing the rotor blades made the students realize how important it is to control the variables."

8<sup>th</sup> grader, Red Lake School: "I enjoyed making the fan blades the most because we were able to make and experiment ourselves!"

9<sup>th</sup> grader, TrekNorth Charter School: "It was amazing to see how efficient a 'green' house can be and how all its systems work together."

The hands-on activities, highly adaptable to varying levels of science background and students' age, offer the participants to explore and experience concepts in physics and chemistry as well as apply the scientific method as they design, build, manipulate and analyze renewable energy systems in small workgroups. The one day science program at the *BioHaus* includes

- 4-5 hours of hands-on of science activities
- German lunch at *Waldsee's Gasthof*,
- written materials with suggestions on how to expand on the *BioHaus* experience
- written materials on the wind generation activities for optional continuation in the classroom
- a complete wind generation kit for the classroom

We are now taking reservations for classes to partake in the program in 2009/2010.

For fall '09 and spring 2010 program dates please contact Edwin Dehler-Seter

**Program cost** (indicated times are flexible and can be adjusted depending on need)

1-day program (9:30am -2:30pm, incl. authentic German lunch) \$35 per student

2-day overnight program (11am – 1pm next day, incl. lunch, dinner, breakfast, lunch) \$75 per student

### Contact

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## Program Schedules

**1-Day Schedule** (Schedule is being adjusted according to travel time and busing needs of the school)

**9:15** Arrival at *BioHaus* Environmental Living Center

**9:30** Welcome and introduction to renewable energy sources using two activities in which students a) categorize images of energy sources based on the categories 'fossil fuel, renewable energy source, and alternative energy source' and b) assign value judgments to images of energy sources and their use by people, transportation means, human interaction with natural environment, and others based on the categories 'environmentally friendly vs. environmentally harmful'.

9:45 **OPTIONAL:** Creating awareness about daily energy consumption by using small electrical appliances. Students first estimate and then with the help of a watt meter (Kill-A-Watt) measure the energy consumption of a variety of small household appliances typically used on a daily basis. This activity is followed by a brief discussion on energy consumption/conservation.

**10:00 Station 1: Wind generation.** In pairs or small groups students learn about the basic components of wind generation, design a rotor with blades, test its performance, record findings, evaluate, make design changes, retest, etc. until they are satisfied with their rotor design. Emphasis is on applying the scientific method by controlling all variables but one.

**11:00 Station 2: Solar hot water heater.** Divided into two groups of competing scientists, students learn about the basic components of a solar hot water heater by designing and manipulating their own model solar panel choosing from provided materials/components with the goal of building the most effective hot water panel. Competing teams run a 20 minute test on the solar panel's performance by collecting, recording, and analyzing temperature data of the panel's interior air and the storage tank's water. Incorporated are small demonstration experiments to explore the concepts of energy reflection/absorption and convection and its changes on the molecular level.

**12:00** Lunch in *Waldsee Gasthof*

**12:30** Exploring the *BioHaus* - a scavenger hunt. In pairs, students equipped with pencil, paper, a list of questions/ clues, and a ruler find, observe, measure and manipulate various parts of the BioHaus to find the answers to their questions. This activity is followed by a short discussion on energy-efficient buildings.

**13:30** Experimenting with the solar powered fuel cell vehicle. A combination of small demonstration and hands-on activities provide an introduction into the workings of the hydrogen fuel cell and its application.

**OPTIONAL ALTERNATIVE:** Measuring my ecological footprint. With the aid of an online computer program, in pairs, students calculate their ecological/carbon footprint by answering a list of questions about their interaction with the environment and their use of the earth's resources. This activity requires a thorough debriefing and discussion.

Wrap-up.

**14:15** Program evaluation by students and teachers

**14:30** Departure

## 2-Day Overnight Schedule

This schedule incorporates all of the above activities while allowing for a more in-depth experience and expanded experimentation time for the students. It also provides the opportunity for extensive discussions on the significance of the BioHaus for sustainable building design as well as how renewable energy systems are able to change our lives. In addition, this schedule makes it possible to offer a special evening program like an environmental simulation or any other activity.