


MRSEC Outreach: Research Experience for Teachers




J. Blume, Division of Engineering, Brown University, supported by NSF DMR-0520651

Secondary or Primary school teachers spend 2 summers working with Brown Faculty and Students. 4-8 teachers per year are accommodated. John Shilko of Pawtucket Middle School facilitates the program. Teachers work with faculty to develop classroom modules for their use. Teachers are given weekly tours and demonstrations of science research labs throughout the campus.



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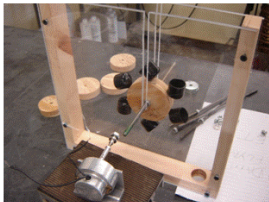
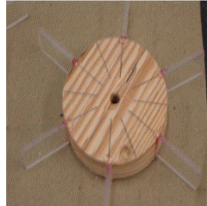
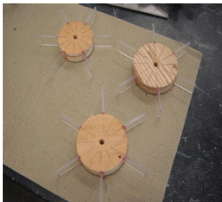
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Example Project, Summer 2008: **Renewable Energy, Modeling Hydroelectric Power**
Adam Flynn, Science Teacher, Davies C&T High School, Lincoln RI and Professor Janet Blume, Brown.

This curricular project provides students with an opportunity to describe and diagram changes in energy that occur in a system, specifically in a hydroelectric power plant. The project also allows students to identify, measure, calculate, and analyze qualitative and quantitative relationships associated with energy transfer and transformation during the design process. Throughout this process, students will design, build, and compare the efficiency of their various hydroelectric turbines.


- Students are presented with quantitative and qualitative variables that they may manipulate during the design and construction process, their decisions are to be grounded in basic physics principles that they have already learned.
- Students then test and compare their turbines and decide what qualities have the greatest effect on the efficiency of a hydroelectric turbine.
- Finally, students will calculate the maximum power output of the water jet, the velocity of the water jet, and the height needed for the water to reach that same velocity through free-fall motion.




Building a Working Solar Cell in Middle School Science


Timothy Newbold, RET Teacher Researcher, The Gordon School; Research Advisors: David Flame, PhD, and Janet Blume, PhD, Brown University




Project Overview:
This curricular project incorporates alternative energy technology, lab skills, metric scaling, precise measurement, and lab report writing skills into Mr. Newbold's 6th grade science classes. The project ties in well with the energy unit and current global concerns around energy consumption. Human energy needs are ever growing and with the increased concern about climate change, we need clean abundant sources of energy. The interactive approach of this project is designed to enhance the students learning.




Materials for Titanium Oxide Paste



Fabricated Sintering Furnace



Solar Cell Testing Apparatus



Completed Solar Cell

- Background information is presented and discussed with the students to prepare them for the project. They will also have to do some research on alternative energy technology and share their findings with their fellow students.
- The students will then be divided up into small groups and given the instructions for building their own solar cell. The instructor will be there to supervise and support them through the entire process. Precise measurements, teamwork and patience will be needed to accomplish the task successfully.
- Students will test their completed cell, and lastly, they will write up a formal lab report addressing the whole experience.

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