An Interdisciplinary, Project-Based Class in Sustainable Energy

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Outline

1. Description of Course: **Physics and Mathematics of Sustainable Energy**
2. Some Lessons Learned
3. Challenges and Questions
4. Conclusions

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Course Context

- Co-taught with an Electrical Engineer
- Offered at College of the Atlantic, where all students design their own majors
- Background: some algebra.
- Course meets Science and Quantitative Reasoning distribution requirements
- Use *Sustainable Energy---Without the Hot Air*, David McKay, UIT 2009. http://www.withouthotair.com

Course Content

- Conservation of Energy, Power vs. Energy
- Basics of Wind, Solar Thermal, Solar PV
- Thermal Energy, Heating and Cooling
- Energy Consumption of Manufacturing and Agriculture
- **Basic Financial Mathematics, Time Value of Money**
- Transportation: Cars, Trains, Planes

Course Concepts

- Numbers not Adjectives
- Proportional Reasoning
- Estimation
- Intuitive Feel for Energy Units
- The Energy System
- Thinking Big: Beyond Lightbulbs
- Choosing among Options
- Spreadsheets

Labs

- Watt Meters. Build Generators. Build Wind Turbines.
- Field trip and/or help with solar installation
- Major term-long, applied group project

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Projects

- Reducing energy use at Beech Hill Farm
- Reducing energy use at Fiddler's Green Restaurant
- Fossil-fuel free heating options for College of the Atlantic
- Renewable energy options for presidential housing at College of the Atlantic

  Students write a technical report and publicly present recommendations to business owners and college administrators

Successes

- Great way to teach STEM
- Engages students of different levels
- Important and relevant topic
- **Financial math is essential**
- **Students find a solutions-based project to be challenging but rewarding**

Challenges

- Not depressing/paralyzing students
- But remaining honest about the magnitude of the problem
- Balance between projects and basic content
- Helping students distinguish between energy and power
- There is not a suitable textbook for the course

Conclusions

- Sustainable energy is a timely and engaging topic and a great way to teach STEM concepts and skills
- We are in the early stages of writing a book for the course
- We welcome input and suggestions
- We encourage others to teach about renewable energy

Thank you

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For more information:

- A. Demeo, D. Feldman, M. Peterson, A Human Ecological Approach to Energy Literacy through Hands-on Projects: An Essential Component of Effectively Addressing Climate Change. *Journal of Sustainability Education.* Vol. 4. Jan. , 2013.
- http://hornacek.coa.edu/dave/Teaching/Energy.S13