



## Green Jobs and Economics

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### INTRODUCTION

Increasing the number of green jobs available and working towards energy efficient and renewable energy innovations will be some of the strongest assets we have to combat the current global economic crisis. Therefore, it is imperative that we educate students about the importance of green jobs and green business practices, especially as these will play an integral role in rebuilding and strengthening our economy and environment.

### LESSON OVERVIEW

**Grade Level & Subject:** 9-12: Economics, Social Studies, Technology, Vocational Education

**Length:** One class period

**Objectives:** After completing this lesson, students will:

- Understand the economic benefits associated with green jobs.
- Have a grasp of the economic value of energy-efficient appliances and other green products and upgrades.

#### National Standards Addressed:

This lesson addresses the following National Education Standards<sup>1</sup>

- **Content Standard:** [NSS-EC.9-12.2 MARGINAL COST/BENEFIT](#)

As a result of activities in grades 9-12, students will understand that:

- Marginal benefit is the change in total benefit resulting from an action. Marginal cost is the change in total cost resulting from an action.
- As long as the marginal benefit of an activity exceeds the marginal cost, people are better off doing more of it; when the marginal cost exceeds the marginal benefit, they are better off doing less of it.
- To produce the profit-maximizing level of output and hire the optimal number of workers, and other resources, producers must compare the marginal benefits and marginal costs of producing a little more with the marginal benefits and marginal costs of producing a little less.

- **Content Standard:** [NSS-EC.9-12.9 ROLE OF COMPETITION](#)

As a result of activities in grades 9-12, students will understand that:

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<sup>1</sup> <http://www.education-world.com/standards/>

- The introduction of new products and production methods by entrepreneurs is an important form of competition and is a source of technological progress and economic growth.
- **Content Standard: [NSS-EC.9-12.15 GROWTH](#)**  
As a result of activities in grades 9-12, students will understand that:
  - Economic growth is a sustained rise in a nation's production of goods and services. It results from investments in human and physical capital, research and development, and technological change, and from improved institutional arrangements and incentives.
  - Economic growth has been the primary vehicle for alleviating poverty and raising standards of living.
  - Economic growth creates new employment and profit opportunities in some industries, but growth reduces opportunities in others.

#### Materials Needed:

- Calculators
- Computers with internet access
- **Reproducible One** – Cost-Benefit Analysis
- **Reproducible Two** - Sustainable Business Practices Fact Sheet

**Assessment:** Students will be assessed through the following:

- Participation in class discussion.
- Completion, thoroughness, and quality of cost-benefit analysis assignment.
- Completion, thoroughness, and quality of extension assignment.

## LESSON BACKGROUND

#### Relevant Vocabulary:

- **Cost-Benefit Analysis:** A process that weighs the total expected costs against the total expected benefits of one or more actions in order to choose the best or most profitable option.
- **Investment:** Depositing or spending money or capital in order to gain profitable returns, as interest, income, or appreciation in value.
- **Up-Front Cost:** Those expenses incurred when beginning a new project.
- **Pay-off:** Return of up-front costs and investment.
- **Short-Term Benefits:** The initial benefits associated with a project.
- **Long-Term Benefits:** The long lasting benefits associated with a project, which are not seen immediately.
- **Green job:** "It has to pay decent wages and benefits that can support a family. It has to be part of a real career path, with upward mobility. And it needs to reduce waste and pollution, and benefit the environment."-- Phil Angelides, Apollo Alliance.<sup>2</sup>
- **Energy Efficiency:** Percentage of total energy input to a machine or equipment that is

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<sup>2</sup> Apollo Alliance, <http://www.time.com/time/health/article/0,8599,1809506,00.html>

consumed in useful work and not wasted as useless heat. Saves money and energy as compared to non-energy efficient products.

- **Renewable energy:** Any naturally occurring, theoretically inexhaustible source of energy, as biomass, solar, wind, tidal, wave, and hydroelectric power, that is not derived from fossil or nuclear fuel.
- **Sustainability:** Ensuring that the needs of the present are met so that the needs of the future can also be met.

### Information:

Businesses and families alike often face the challenge of wanting to implement green practices, but not wanting to bear the burden of the potentially higher costs associated with going green. In completing the following cost-benefit analysis of numerous green products, students will see firsthand that, although such products may cost more upfront, the payback greatly outweighs the initial cost.

According to the Department of Energy, Energy Star qualified appliances use 10–50% less energy and water than standard appliances. The money one saves on utility bills over time can more than make up for the cost of a more expensive but more efficient Energy Star model. Furthermore, replacing your old heating and cooling equipment with Energy Star qualified equipment can cut your annual energy bill by almost \$200. In terms of lighting, an Energy Star qualified compact fluorescent light bulb (CFL), which uses 75% less energy and lasts about ten times longer than an incandescent bulb, will save about \$30 and will ultimately pay for itself in about six months.

### Resources:

- EnergyStar, <http://www.energystar.gov/>
- San José University Department of Economics, <http://www.sjsu.edu/faculty/watkins/cba.htm>
- 12Manage, [http://www.12manage.com/methods\\_cost-benefit\\_analysis.html](http://www.12manage.com/methods_cost-benefit_analysis.html)

## LESSON STEPS

### Warm-up: *Discussion*

1. Discuss the economic benefits of green jobs
  - a) What kinds of small changes can businesses and families make to increase energy efficiency and decrease their carbon footprints? (*Energy efficient lights and appliances, reducing energy use, reducing water use, recycling, carpooling, biking to school and work, etc.*)
  - b) From a business standpoint, why does it make sense to go green? (*Long term benefits: cut costs in the long run, save energy, improve efficiency, portray a positive image, etc.*)
  - c) Aside from reducing long-term costs, what other economic benefits can be seen through implementing green practices? (*With an increasing concern about climate change and the economic downturn, thousands of jobs are being created in the green job sector. Job creation in this area will provide thousands with jobs, strengthen our economy, and keep the United States internationally competitive. Buying and using green products and alternative energy and supporting businesses with sustainable practices will contribute to the growth of this sector while improving the*

*environment and combating climate change).*

### **Activity One: Cost - Benefit Analysis**

1. This activity will introduce students to the economic differences between regular and energy-efficient products and give them a clear picture of how effective energy-efficient products are in cutting costs.
2. To introduce students to important economics vocabulary, explain the difference between up-front costs, investments, pay-offs, and short-term and long-term benefits.
3. Explain to students that cost-benefit analysis is useful in determining if a project is worth implementing or a product is worth using. If the outcome of the analysis shows that the benefits outweigh the costs, the project/product is considered efficient and worth using. For example, “Americans, with the help of ENERGY STAR, saved enough energy in 2008 alone to avoid greenhouse gas emissions equivalent to those from 29 million cars — all while saving \$19 billion on their utility bills.”<sup>3</sup>
4. Cost-benefit analysis is conducted by subtracting the total costs from the total benefits (TB-TC).
5. Use **Reproducible One** – Cost-Benefit Analysis worksheet for this activity. Have students research various appliances and the cost-savings of their energy-efficient counterparts.
  - a) Direct students to look online to find an example or average cost for each appliance.
  - b) Possible resources for finding pricing and savings information use:
    - a. Evo, [http://www.evo.com/content/walmart.com\\_usa\\_llc/41378/ge\\_cfl\\_light\\_bulb\\_-\\_13\\_watt\\_12-pk](http://www.evo.com/content/walmart.com_usa_llc/41378/ge_cfl_light_bulb_-_13_watt_12-pk) for information on the economic benefits of CFLs
    - b. EnergyStar [http://www.energystar.gov/index.cfm?c=comm\\_dishwashers.pr\\_comm\\_dishwashers](http://www.energystar.gov/index.cfm?c=comm_dishwashers.pr_comm_dishwashers) for information on the savings of commercial dishwashers
    - c. A Best Kitchen, <http://www.akitchen.com/store/green-dishwashers.html> for prices of commercial dishwashers.
6. After completing this activity, discuss the students’ findings.
  - c) Were they surprised by any of the results?
  - d) Can students think of any other products that would likely have similar economic and environmental benefits?

### **Activity Two: Changing Business Practices**

1. Split your class up into three groups. Tell them that they are the presidents of a company and are interested in adopting new sustainable business practices. Their company can only implement one energy efficient technology or renewable energy source at this point.
2. After setting up this scenario, give your students the following three sustainable business practice options: 1. Install solar panels; 2. Install energy efficient appliances wherever possible (kitchen/cafeteria, bathrooms, boiler room, lighting, heating/cooling, etc.); 3. Create a green roof and plant trees and plants where possible (courtyard, front and or back of building).
3. Provide your students with some basic information on the savings and overall benefits of the three options (**Reproducible Two** – Green Business Practices). Remind students that there

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<sup>3</sup> Energy Star, [http://www.energystar.gov/index.cfm?c=about.ab\\_index](http://www.energystar.gov/index.cfm?c=about.ab_index).

are also indirect benefits such as: public image/advertising, meeting consumer demand, etc. These may have more or less impact depending on the type of business and the consumer audience involved.

4. In their small groups, have students decide what business they are in and discuss the three possible options. Which of these best fits with their industry and practices?
5. Have them write up a brief explanation (one to two paragraphs or bullet points) of why they made the decision they did, incorporating basic cost-benefit analysis.
6. Have the class come back together and share their decisions. Once all of the groups have presented their decisions, have groups which differed in their decisions briefly discuss and debate these options.

### **Wrap-Up: *Changing Business Practices Discussion***

1. Discuss the students' decisions, explanations and understanding of the Changing Business Practices Activity:
  - a. Do students understand the economic benefits associated with going green?
  - b. Can students think of any other green business practices aside from the three used in the activity?
  - c. How does "going green" (implementing cost-effective green products) allow a business relate to green jobs? (*Supports green manufacturing, research and design sectors and provides jobs for people as production, installation, and maintenance of green products are required*).
  - d. Do students think that green jobs are only those that are directly related to helping the environment (i.e. solar panel manufacturers, recycling companies, bicycle builders, etc.) or can green jobs also include those who pledge to use green business practices and work in a green workplace?

### **Extension: *Homework Assignment***

1. Have your students research other sustainable options that businesses are implementing across the country. If possible, present articles highlighting some of these recent options, innovations and decisions for businesses. Look in business, environmental or other sources. Have students choose either a company or a sustainable business practice to highlight in a short research paper. (*Could include LEED certification, bike to work compensation programs, organic cafeterias, etc*).
2. Have your students think about green business practices as they apply at your school. Your school could be considered a business, and administrators have to think about many of the same issues that business owners do. Visit [www.earthday.net/greenyourschool](http://www.earthday.net/greenyourschool) for a comprehensive list of ways to green your school and building. Have students review these options, research how they could be implemented at your school, and write up a report focused on the business sense of your school going green. Consider cost-benefit analysis, efficiency, staff/student health and safety, etc. If possible, present this research and greening plan to administrators at your school!

## **CONCLUSION**

Although some people argue that the costs of energy efficient products and sustainable building is prohibitive to implementing change, in the long run, the savings of using environmentally-friendly

products will pay off the initial costs and ultimately save money! The monetary, health, and environmental benefits seen from implementing sustainable business practices cannot be overlooked. Green jobs will continue to be the crucial sector in coming years, and just as green jobs support green business practices, so do green business practices support green jobs.

# Cost-Benefit Analysis

Name \_\_\_\_\_

Fill in the following table with data on the suggested products. Each product has a range of prices, so choose one price for each appliance in order to make your analysis simple and clear. Once you have found the cost of each product, research the savings one can expect when using energy efficient models of each product.

Product	Purchase Cost (\$)	Annual Savings (\$)
Regular Dishwasher		
Energy Star Dishwasher		
Regular Air Conditioner		
Energy Star Air Conditioner		
Incandescent Light Bulb		
CFL		

### Data Analysis:

- How many years will it take for the energy efficient products to pay for themselves?
  
- Although the up-front costs of the energy efficient products are large, do you think there are short-term benefits associated with the energy saving products (these benefits do not have to be economic)? If so, what are some of these benefits?
  
- What are some the long-term benefits (economic or other)?
  
- From the data you have found, do you think that using energy efficient products is economically beneficial? Why or why not?

## Green Business Practices

Name \_\_\_\_\_

### Solar Panels

As a baseline, a small office can expect to pay about \$15,000 to implement solar panels, while large, industrial companies may pay \$200,000 to \$500,000. If a small company uses 1000KWH per month and it costs \$200, installing solar panels that provide 250KWH each month will have the short-term benefit of taking \$50 off the company's energy bill. In the long-term, solar panels can ultimately eliminate the energy bill entirely. Also, depending on the state, companies may be able to earn rebates or tax credits from installing solar panels.

\*Information from: Borrego Solar, <http://www.borregosolar.com/business/solar-power-costs-savings.php> and Trusty Guides, <http://www.trustyguides.com/solar-panels3.html>

### Energy Efficient Appliances

Using energy efficient appliances can greatly decrease a company's utility bills.

Product	Purchase Cost (\$)	Savings (\$)
Regular Commercial Dishwasher	2,760-10,980	
Energy Star Commercial Dishwasher	3,095-8,039	850 (annually)
Regular Air Conditioner	100-570	
Energy Star Air Conditioner	150-560	30 (annually)
Incandescent Light Bulb	0.52-0.84	
CFL	1.29-2.53	38 (over lifetime)

\*Data taken from: [www.sears.com](http://www.sears.com), [www.walmart.com](http://www.walmart.com), [www.energystar.gov](http://www.energystar.gov), [www.foodservicewarehouse.com](http://www.foodservicewarehouse.com), [www.akitche.com](http://www.akitche.com)

### Green Roof

Costs for green roofs are approximately \$15 to \$20 per square foot (these costs include all aspects of green roof development and implementation). Rooftop vegetation has multiple benefits, including: moderating the temperature extremes of a roof surface, preventing it from being exposed to ultraviolet radiation and cold winds that could accelerate its break down, and prolonging the service of the life of the roof by at least 20 years (compared to a conventional roof). Other economic benefits include those resulting from: increased insulation, the opportunity for greenhouse gas trading credits, and increased property value.

Environment Canada found that a typical one storey building with a grass roof and 3.9 inches of growing medium would result in a 25% reduction in summer cooling needs. Another study found that a 6 inch extensive green roof reduced heat gains by 95% and heat losses by 26% compared to a conventional roof. The Fairmount Waterfront Hotel in Vancouver, Canada grew herbs, flowers, and vegetables on its green roof, ultimately saving its kitchen about \$30,000 a year in food costs.

\*Information taken from: Urban Design Tools, [http://www.lid-stormwater.net/greenroofs\\_cost.htm](http://www.lid-stormwater.net/greenroofs_cost.htm) and Green Roofs for Healthy Cities, [http://www.greenroofs.org/index.php?option=com\\_content&task=view&id=26&Itemid=40](http://www.greenroofs.org/index.php?option=com_content&task=view&id=26&Itemid=40)