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## Lesson 4.1 – Engineering Design Ethics

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### Concepts

1. The material of a product, how the material is prepared for use, its durability, and ease of recycling all impact a product's design, marketability, and life expectancy.
2. All products made, regardless of material type, may have both positive and negative impacts.
3. In addition to economics and resources, manufacturers must consider human and global impacts of various manufacturing process options.
4. Laws and guidelines have been established to protect humans and the global environment.
5. A conscious effort by product designers and engineers to investigate the recyclable uses of materials will play a vital role in the future of landfills and the environment.

### Performance Objectives

*It is expected that students will:*

- Create a brainstorming list of different products made from common materials that are used daily.
- Research and construct a product impact timeline presentation of a product from the brainstorming list and present how the product may be recycled and used to make other products after its lifecycle is complete.
- Identify the five steps of a product's lifecycle and investigate and propose recyclable uses for the material once the lifecycle of the product is complete.

### Essential Questions

1. What is meant by engineering design ethics?
2. What is ethics?
3. Why is it important to understand ethics and how it relates to product design?
4. Why is it important to study a product's lifecycle?
5. What factors influence the selection of materials to make a product?
6. What do you think of when you hear the word *impact*?
7. How can a manufacturing process impact an environment?
8. How do ethics impact the production of products?
9. What global and human impacts must be considered by all involved with the design, manufacture and distribution of products?

10. Why is it important to have clear, accurate, and detailed communication among all involved in the design, manufacture and distribution process?
11. What laws exist in the United States to protect humans and the environment?

## Key Terms

<b>Attorney General</b>	<b>By-product</b>	<b>Carcinogen</b>
<b>Ecosystem</b>	<b>EPA</b>	<b>Ergonomics</b>
<b>Ethical</b>	<b>Ethics</b>	<b>Hazard</b>
<b>Impact</b>	<b>Landfill</b>	<b>OSHA</b>
<b>Product lifecycle</b>	<b>Raw Material</b>	<b>Recycle</b>
<b>Refurbish</b>	<b>Refuse</b>	<b>Residue</b>
<b>Trade-off</b>	<b>Waste</b>	

## Instructional Resources

### PowerPoint® Presentations

[Global, Human, and Ethical Impacts](#)

### Word Documents

[Activity 4.1.1 Product Lifecycle](#)

[Problem 4.1.2 Engineering Design Ethics Design Brief](#)

[Product Lifecycle Rubric](#)

[Problem 4.1.2a Sample Engineering Design Ethics Design Brief](#)

[Problem 4.1.2b Engineering Ethics Design Brief Template](#)

[Lesson 4.1 Key Terms and definitions in Excel](#)

### Reference Sources

Barton, M. (Fall, 2004). *Human impacts on the environment: An archaeological perspective*. ASB 326. Retrieved June 5, 2006 from [http://www.public.asu.edu/~cmbarton/Human\\_impacts.htm](http://www.public.asu.edu/~cmbarton/Human_impacts.htm)

Environmental Protection Agency (EPA). (June 5, 2006). *U. S. environmental protection agency*. Retrieved June 5, 2006 from <http://www.epa.gov/>

Farlex, Inc. (2005). *The free dictionary by Farlex*. Retrieved June 5, 2006 from <http://www.thefreedictionary.com>

Hacker, M., & Burghardt, B. (2004). *Technology education: Learning by design*. pp 538-549 Upper Saddle River, NJ: Pearson/Prentice-Hall.

International Technology Education Association. (2000). *Standards for technological*

- literacy: Content for the study of technology*. Reston, VA: Author. pp 236-242.
- Marketing Teacher. (2006). *Lessons on how to market a product*. Retrieved June 5, 2006 from <http://www.marketingteacher.com>
- Markkula Center for Applied Ethics. (2006). Retrieved June 9, 2006 from <http://www.scu.edu/ethics/>
- Merriam-Webster. (2006). *Merriam-Webster online*. Retrieved June 5, 2006 from <http://www.webster.com>
- National Council of Teachers of English (NCTE) and International Reading Association (IRA) (1996). *Standards for English language arts*.
- National Council of Teachers of Mathematics (NCTM). (2000). *Principles and standards for school mathematics*. Reston, VA: Author.
- National Research Council (NRC). (1996). *National science education standards*. Washington, D. C.: National Academy Press.
- Online Ethics Center for Engineering and Science. (2005). *The Online Ethics Center for Engineering and Science*. Retrieved June 9, 2006, from <http://onlineethics.org>
- Oxford University Press. (2006). *AskOxford: Oxford reference online*. Retrieved June 5, 2006 from <http://www.askoxford.com/dictionaries>
- Quick MBA Marketing. (2004). *The product life cycle*. Retrieved June 5, 2006 from <http://www.quickmba.com/marketing/product/lifecycle/>
- Rabins, M. J., Harris , E., Pritchard, M. S., & Lowery, Jr., L. L. (n.d.) *Engineering ethics*. Retrieved June 9, 2006, from <http://ethics.tamu.edu/>
- University of Minnesota. (n.d.). *University of Minnesota extension service*. Retrieved June 5, 2006 from <http://www.extension.umn.edu>
- U. S. Department of Labor. (August 22, 2005). *Occupational safety and health administration (OSHA)* Retrieved June 5, 2006 from <http://www.osha.gov/>