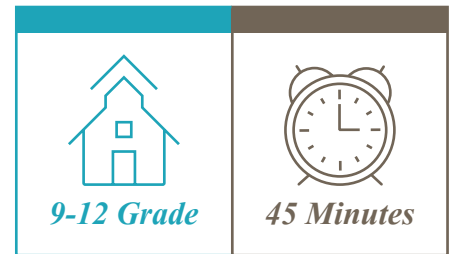


Lesson 5:

The Best of Intentions with Product Development

**Subjects:**

Consumer economics,
Environmental science

**Setting:**

Classroom

**Pre-Homework:**

DSRP vocabulary, review the
PPCPs in the Environment
Worksheet [**Lesson 4**]

INTRODUCTION

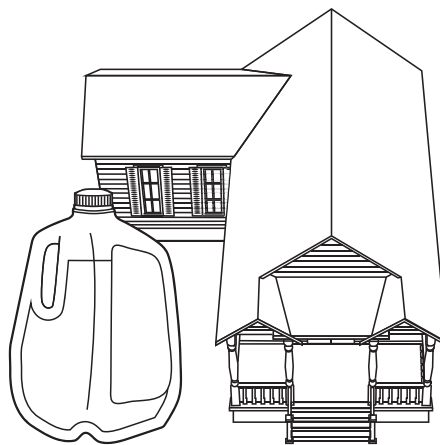
A well-designed product requires planning from “cradle to grave.” Many products have unintended consequences, some good, some bad. The challenge for any developer is how to create a product that benefits the target audience without adversely affecting unintended populations. Developers must consider the trade-offs, and the answers are not always easy to determine.

STUDENT OBJECTIVES

1. Consider the precautionary principle, life cycle assessment (LCA), and the unintended consequences of pharmaceuticals and prescription care products.
2. Analyze the issue’s trade-offs from at least three perspectives.
3. Design a best-case solution that minimizes unintended impacts to the environment and is feasible for businesses and consumers.

DAILY ASSESSMENT

Students should participate in group conversations and debates to show that the ideas and concepts were internalized.

**Materials:**

- Internet Access (for research or instruction)
- Worksheet (PPCPs in the Environment) [**Lesson 4**]

DSRP Vocabulary:

- ▶ Life cycle assessment (LCA)
- ▶ Precautionary principle
- ▶ Unintended consequences

STATE AND NATIONAL STANDARDS

COMMON CORE

Literacy: RST.9-10.8
RST.11-12.7
RST.11-12.8

Math: MP.2
HSN.Q.A.1
HSN.Q.A.2
HSN.Q.A.3

NAAEE GUIDELINES

3.1
3.1.B
3.1.C

NGSS

HS-LS2-7
HS-ETS1-4

The Take-Away

Product developers have to be aware of LCA and possible unintended consequences when creating new products. The precautionary principle is a wise habit to implement.

All instructions that begin with an * are found on the Illinois-Indiana Sea Grant Resource or YouTube Page <http://tinyurl.com/oyhlv9z>

Conventional Classroom Procedure:

1. *Explain the precautionary principle, life cycle analysis, and unintended consequences. Use an example that is familiar to students. Students should familiarize themselves with the concepts presented on the video resources *'This is Your Life Cycle' fun life cycle assessment & design* animation, *Life Cycle Assessment as part of Strategic Sustainability for Product Design, Tragedy of the Commons, Unintended consequences* (a Ted-Talks video), *What is the Precautionary Principle, and is it Good or Bad?*, and *The shocking cost of wasted prescription pills*.
2. Split students into three or six groups. Assign each group a concept (precautionary principle, life cycle analysis, unintended consequences). Have them discuss how their concept can be applied to the issue of pharmaceuticals and personal care products. They should take cost, safety, reliability, and aesthetics as well as social, cultural, and environmental impacts into account. They can use the Pharmaceuticals and Personal Care Products in the Environment Worksheet as examples of products to focus on for their concept. They should write down their ideas using the worksheet provided.
3. Once the groups have presented their view, other groups should constructively critique each view for possible holes in the arguments, consideration of the perspectives of other stakeholders, and contradictory data based on experience and research. The goal of the debate is to strengthen the original view and prepare students to defend their views.
4. If there is time, have students apply these critiques to strengthen their argument.

Flipped Classroom Procedure:

1. The **night before class**, students should:
 - a. Review their Pharmaceuticals and Personal Care Products in the Environment Worksheet from Lesson 4.
 - b. *Familiarize themselves with the concepts presented on the video resources *'This is Your Life Cycle' fun life cycle assessment & design* animation, *Life Cycle Assessment as part of Strategic Sustainability for Product Design, Tragedy of the Commons, Unintended consequences* (a Ted-Talks video), *What is the Precautionary Principle, and is it Good or Bad?*, and *The shocking cost of wasted prescription pills*
 - c. Complete DSRP vocabulary.
2. In class:
 - a. Review the precautionary principle, life cycle analysis, and unintended consequences.
 - b. Discuss real life application of each concept.
 - c. Split students into three or six groups. Assign each group a concept (precautionary principle, life cycle analysis, unintended consequences). Have them discuss how their concept can be applied to the issue of pharmaceuticals and personal care products. They can use the Pharmaceuticals and Personal Care Products in the Environment Worksheet as examples of products to focus on for their concept. They should use the worksheet provided to write down their ideas.

- d. Once the students have presented their view, other groups should constructively critique each view for possible holes in arguments, perspectives of other stakeholders, and data that contradict their view based on experience and research. The goal of the debate is to strengthen the original view and prepare students to defend their views.
3. If there is time, have students apply these critiques to strengthen their argument.

Literature References:

Daughton, Christian G., and Ilene Sue Ruhoy. "Lower-dose Prescribing: Minimizing 'Side Effects' of Pharmaceuticals on Society and the Environment." *Science of The Total Environment* 443 (2013): 324-37.

Wu, Mae, and Sarah Janssen. "Dosed Without Prescription: A Framework for Preventing Pharmaceutical Contamination of Our Nation's Drinking Water." *Environmental Science & Technology* 45.2 (2011): 366-67.

Extensions:

- Have students create a survey to assess environmental habits before and after the students educate on the topic. Take that information to create a PSA on how the school is positively impacting people's attitudes on the topic.
- Debate who is responsible for the cost of extensive testing of products to ensure safety. Google and review *The Precautionary Principle and New Technologies and Products* (Good video, but requires a subscription after about three minutes of viewing.)
- Create a talk show program on PPCPs and put it on a public YouTube channel and share it with Illinois-Indiana Sea Grant to then use on our Sea Grant Education YouTube page.
- Students can explore the types of careers that are involved in PPCP development and research.

Careers related to Pharmaceuticals and Personal Care Products

This is just a short listing.

1. Product Researcher
2. Manufacturer
3. Sale person
4. Pharmacist
5. Chemist
6. Biotech engineer
7. Product tester and developer
8. Environmental science researcher

Name _____ Block/Period _____

Precautionary Principle, Life Cycle Analysis and Unintended Consequences



Our group was assigned _____

How can _____ be applied to pharmaceuticals and personal care products?

What helpful points did other groups make about your topic that will help you strengthen your argument?

What helpful points did you make to other groups to help strengthen their argument?