

MATERIAL RESCUE

DESIGN + SUSTAINABILITY IN THE CLASSROOM



Messenger Bag by Nicola Freegard

The billboard industry turned to the practice of producing billboards from PVC vinyl about 8 years ago, and the U.S. average number of billboards produced last year totaled 600,000. Each billboard is usually used for an advertising campaign for as little as 3 months and then either stored for many years in facilities or placed in landfills... Our decision to do this project was to educate the public about what billboards were made from and how to think of ways to reuse items in a new and different way.

CHALLENGE

How can you demonstrate sustainable ideals through form? How do we reconcile previously held product design attitudes with the goals of sustainability? How could product design evolve to create a truly sustainable economic system? These are the goals and questions to be confronted through this design exercise. You may struggle with learned concepts or personally held beliefs of aesthetic beauty, usability, function and materiality. That is normal and central to this project. Challenge yourself - the reward is in experimentation, originality and risk.

OBJECTIVES

- Develop an understanding of a product's lifecycle and its application to multiple classroom contexts
- Understand how art and design ideas can be influenced by reclaiming materials.
- Exercise the sustainable practices of repurposing/recycling materials into a new product.
- Demonstrate how design can help communicate sustainable ideals in a 3D composition

ESSENTIAL QUESTIONS

- How can our understanding of product lifecycle inform our use of materials in everyday objects?
- How could the design of "new" things evolve to create a truly sustainable product or system?

GOAL

In groups of 3, students will conceptualize and prototype a new "product" made from discarded, repurposed, recycled, found or locally-sourced materials. The aim of this project is to create a second life for the discarded materials and/or products using sustainable design strategies.

PROCESS

1. Gather materials
 - Collect discarded, repurposed, recycled, found, or locally-sourced materials from which to create a product. (Refer to 'Sustainable Design Criteria' below). The only "new" materials allowed are hardware, adhesives, paints and/or resins. Please keep the use of "new" materials to a minimum.
2. Research the Material Lifecycle of the original materials.
 - State the design issues of the composite material source (such as): intended use of product, design specifications, material properties, manufacturing processes, environmental connections (place of use), design limitation/shortcomings. Why were they discarded? How were they produced?
3. Experiment with material manipulations
4. Work to clarify scenario/problem/opportunity.
 - Outline scope of problem that allows for experimentation at multiple scales/contexts/users
 - Organize Problem Statement
 - Draft a Design Statement: Concise sentence or 2 that summarizes primary goal(s), task, user, and context.
 - Prioritize Criteria for success.
 - List contextual parameters that will drive design features, material use, and operation.
4. Design and prototype proposed solution.
 - Identify and create concept sketches for a product form you will create from repurposed materials.
 - Creative iterative models/prototypes of design ideas
 - The final product should be made entirely of reused materials. The only exceptions are fasteners that may be introduced to make the product structurally sound.
 - The final product should address original problem statement
5. Document (in a diagrammatic format)
 - Design Process
 - New material life cycle. How will the old materials be used in your new product?
 - Justify How will the new product could be sustainable
4. Provide construction drawings (scaled, measured, orthographic drawings and assembly diagrams), and a final finish level prototype to show evidence of your final product idea.

DELIVERABLES (DUE AT TIME OF PRESENTATION)

1. Presentation that includes
 - Diagram that shows the lifecycle analysis of original materials and new product
 - Concept development sketches
 - Photos of Prototype Development
 - Construction/Shop Drawings.
 - Final Prototype

SUSTAINABLE DESIGN CRITERIA (from Stuart Walker's *Sustainable by Design*, 2006)

1. The design should make minimal, if any, use of new resources, and cause minimal detriment to the environment.
2. It should make use of readily available materials and components; these could include materials or components distinctive to a locality, locally available mass-produced components for general usage, and mass-produced elements from former applications.
3. Constituent parts should be modified as little as possible so that any future reuse is not compromised by their inclusion in this design.
4. It should be capable of being economically made, maintained, repaired, upgraded, and 're-dispersed' or decommissioned, at the local level. This reduces the need for shipping and packaging and provides opportunities either for local employment or for users to create the object themselves, thereby offering the possibility for greater 'ownership' of their material environment.

REFERENCES

- Fuad-Luke, A. (2007) *EcoDesign: The sourcebook*. San Francisco: Chronicle Books LLC
- McDonough, W. & Braungart, M. (2002). *Cradle to cradle: Remaking the way we make things*. New York: North Point Press.
- Papanek, V. (1995). *The green imperative: Natural design for the real world*. New York: Thames and Hudson Inc.
- Industrial Designers Society of America, EcoDesign Section: <http://www.idsa.org/sections/ecodesign>
- inhabitat: design that will save the world: <http://inhabitat.com/>
- *Upcycling*, from Wikipedia: <http://en.wikipedia.org/wiki/Upcycling>

INFLUENTIAL ARTISTS + DESIGNERS

11 Artists Doing Amazing Things With Recycled Materials

<http://mentalfloss.com/article/13046/11-artists-doing-amazing-things-recycled-materials>

<http://www.treehugger.com/tag/upcycling/>

PROJECT GRADING CRITERIA

Composition of final design 30%

- What is your intention/message? How do sustainable ideals influence product form?
- Is the final form thoroughly explored through drawing/modeling?
- Depth of investigation/experimentation of constituent materials/parts.

Craftsmanship of final prototype 30%

- Appropriateness to design intent.
- Evidence of pride and ownership in work.

Presentation 30%

- Design Statement that reflects sustainable ideas and how you used form decisions to communicate sustainable ideals.
- Concept Development Drawings and Study Model Photos
- Final Design Documentation Drawings and Diagrams
- Lifecycle analysis

Directions and Participation 10%

- Demonstration of regular work habits
- Timely Fulfillment of all project requirements and deliverables

AGENDA

Day 1

1. Lecture and Discussion: Design + Sustainability: Part 1
2. Video and Discussion: Better Living Through Chemistry
3. Reading –
 - *What we touch touches us: Materials, Affects, and Affordances*, by Tom H. Fisher.
 - Chp. 1, A Question of Design, Cradle to Cradle by McDonough & Braungart.
 - Chp. 4, Waste Equals Food, Cradle to Cradle by McDonough & Braungart.

Day 2

1. Lecture and Discussion: Readings & Presentation – Product Life Cycle Analysis (PLCA)
2. In class + Continue for Homework:
 1. Create Groups
 2. Distribute products/materials that will be re-used throughout the project.
 3. Product Disassembly.
 4. Identify Composite Materials, Qualities, Uses, and Advantages

Day 3

1. Students continue product analysis
 - a. Study the Product Life Cycle Analysis (PCLA) of original product/materials composite materials.
2. In-Class and Continue for Homework: PLCA
 - a. Trace the life cycle of your products components all the way back to the raw natural material (through harvesting, processing, and transportation):
 - b. Identify all of the major steps and processes involved in turning the raw material into a usable component.
 - c. Identify additional chemicals and/or materials involved/consumed in the separate processes.
 - d. Graphically map the life of the product forward from manufacturing. Think:
 - i. Assembly and transportation
 - ii. Packaging
 - iii. Distribution
 - iv. Use/installation/consumption
 - v. Post-consumer Disposal or Recycle/repurpose
 - vi. The more detailed analysis, the better!
 - e. Based on your understanding of eco-design strategies, evaluate the "Greenness" of this original product.
3. DUE: Next Class
 1. Record findings through words and images, and organize the information into an printed infographic or graphic outline.
 2. Be prepared to verbally present and share your

Day 4

1. PLCA presentations
2. In Class + Form Homework
 - a. Experiment with different ways to cut, adhere, bend, melt, joint, etc.

Day 5

1. Work Day: continue material experiments
2. Assignment: Photo Document material experiments

Day 6

1. Develop Design Brief

- a. Identify a Design need (this can also be assigned by the teacher). How can this material be formed to create a new and useful product or device
- b. Who will you design for?
- c. What's your Goal in solving for the need
 - i. In addition to Designing for Sustainability, what will be your criteria for success?

Day 7

1. Review and Refine Design Brief
2. Begin Initial product concept development. Each team member Develop 10+ Thumbnail Ideas testing different solutions and material uses
3. Continue for Homework

Day 8

1. In-class: Work Day – Table Review of Thumbnail ideas in your groups
2. Homework Assignment: 1 Refined Concepts Sketch per group member

Day 9

1. In-Class Pin-up: 4 Concept Sketches
2. Homework Assignment: Decide on Final concept direction and formalize a design statement.

Day 10

1. In-Class: Work on creating construction diagrams
 - a. Measured drawings that detailing assembly
 - b. Finalize materials list (source enough materials for 2 prototypes (plan for failure/mistakes)
2. Homework: Finish construction drawings and collect any needed supplies from home

Day 11

1. Desk-Crit: review final direction with instructor
 - a. Due: Refined Final Concept Drawings & statement; construction drawings; sustainable system proposal; materials list
2. Begin Construction

Days 12, 13, 14

1. Work Days

Day 15

Due: Prototype @ 75% completion

1. Silent in class walk through (bring post-its!!!)
2. Assignment: complete/revise prototype; complete presentation

Day 16

1. Project Presentations
 - a. Diagram that shows the lifecycle analysis of original materials and new product
 - b. Concept development sketches
 - c. Photos of Prototype Development
 - d. Construction/Shop Drawings
 - e. Final Prototype