

Title: *Reverse Engineering*
Grade Level: 9 10 11 X 12
Fellow: Gabriel Burks
Teacher: Schuyler Patton

Date: October 2013
Subject: Mat Sci/ALL
School: Central High

Grand Challenge(s) Covered:

- Engineer the tools of scientific discovery

Activity Time Length:

- 40-60 minutes to conduct activity
- Ongoing discussion about findings and principles behind manufacturer's materials selection and function

Goals and Outcomes:

- Students will gain some experience with everyday materials
- Students will explore and discuss several appliance constructs and assemblies to help develop an understanding of why engineers/scientist select various material types to accomplish specific tasks in devices

Learning Objectives: At the conclusion of this module, the student will be able to:

- To identify different types of engineering materials
- To deconstruct some common appliances
- To discuss the relative proportions of the material types used in the appliance
- To compare and contrast separate appliance constructs and materials selection rationale

Materials:

- Old (unworkable) appliances such as toasters, irons, hair driers, VCRs, clocks, slide projectors, curling irons, cameras, mechanical or electrical toys, (no TVs or microwaves for safety reasons).
- Tools: Screwdrivers (both Phillips and flathead), Pliers, Wire cutters, Storage Containers, Permanent marker pens for labeling and perhaps some other tools as needed.
- Safety glasses

Caution: Everyone in the proximity of the work area as well as workers with materials or tools must wear safety glasses at all times during this experiment. NO SHATTERING!!!

Procedure/Methods:

1. Dismantle the appliance using the tools needed to remove the appliance's casing and inner parts. Complete disassembly is not necessary, just enough to observe the material types of various parts.
2. Separate disassembled parts by material type: metals, ceramics, polymers, and composites.
3. Discuss the relative quantities of each material type used in the appliance.

4. Record observations about the disassembled appliances in the laboratory record book. Details could include: drawings of appliances or specific parts, type of appliances worked on, types of material the major parts of the appliance are made from, etc.
5. Follow these directions and answer questions:
 1. Choose **5 different parts** of the appliance and answer for each:
 - a. What type of material is the part made of (metals, ceramics, polymers, or composites)?
 - b. Name at least 4 (more is better) reasons why that material type was chosen for its specific purpose.
 - c. If a “better” material could have been used, why do you think the manufacturer decided to use the material that was used in the appliance? Provide 3 examples. (The term “better” must be defined for each example.)
 2. Looking at the parts, what other appliance could be constructed of essentially the same parts? Describe in detail. (To make this a little bit easier, you can hypothetically trade some parts with other groups.)
 3. Find a group with a different appliance. Describe the similarities and differences in the types and purposes of the materials used.
6. Put all parts in the storage box and place the box on the side counter in the lab area. We will use these parts for another lab project soon.
7. **Turn in one write-up per group including: detailed observations, answers to above questions and some conclusions about what was learned in this project. Organization of this write-up is up to you, but must be well communicated.**

Evaluation: Evaluation is based on students’ answers to stated questions and their ability to communicate their findings/conclusions thru writing (no-Rubric attached).

Teacher Reflection: