Session 6

One Problem, Many Solutions

Engineering Fundamentals

In This Session:

A) Clocks of All Varieties (45 minutes)
- Student Handout
- Student Reading

B) Form Meets Function (45 Minutes)
- Student Handout

C) Tick Tock: How a Clock Works (60 Minutes)
- Student Handout

In *One Problem, Many Solutions,* take on the role of an engineer and apply analytical skills to understand how the requirements of a product are met—in this case, a clock.

In *6A: Clocks of All Varieties*, take a close look at the clocks and as a class come up with design requirements for clocks. In *6B: Form Meets Function*, see how the requirements are met in different clock radios as you consider form and function. Then, in *6C: Tick Tock: How a Clock Works,* disassemble the clock radios to see how the electronics and mechanics work to make a clock "tick."

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Clocks of All Varieties

Handout: Session 6, Activity A

Have you ever been in an electronics store and seen how many different types of clock radios there are (or TVs and stereos, for that matter)? Clock radios are an excellent product for understanding form and function. To begin, look at one clock radio and consider what the basic requirements of a clock radio are. Record your observations in your design notebook.

1. List the main functions of clock radio.
2. Describe all the things the one in front of you can do in addition to the basics listed above.
3. Describe its size, shape, and materials—everything you can see—in detail.
4. Now think carefully about where it sits in a bedroom. How it is it used? What does a user have to do to use a clock radio? Be very specific. You are collecting data about a user.
5. When it is it used?
6. What are the conditions (time of day, user's attitude, etc.) under which it is used?

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Meet a Project Manager

Reading: Session 6, Activity A

David Thorpe
Senior Project Manager
ZIBA Design

Introduction

Hello, my name is David Thorpe. When I was young, I was always making things, drawing and writing. I made puppets, wrote my own comic books, built things from a big bucket of Lego* blocks (not the prepackaged kits), and built tree houses, forts, and rafts for our pond. I went to college at Stanford University thinking that I was going to be a computer programmer, but after a few semesters of "flipping bits," I changed to the Product Design program in the Mechanical Engineering department. The Product Design program teaches problem solving, brainstorming, and sketching skills to engineers along with the technical aspects of engineering. After college, I worked at Hewlett-Packard designing and engineering inkjet printers for four years and then joined ZIBA Design in 1993.

A Typical Day

My day usually consists of a combination of meetings to make sure everybody knows what they are supposed to be doing, group brainstorms, and then some detailed design work on my own. I alternate between design on the computer and rough concept sketching. There is usually a lot of informal interaction with others in the office as we bounce ideas off one another, get updates on other projects, and banter back and forth.

Most Interesting Thing About My Job

I really enjoy the diversity of projects that I work on and interacting on a daily basis with talented, creative co-workers.

Advice

My advice to younger people entering the design or engineering field is to understand both the technical and creative side of both. There are plenty of great designers and engineers, but not as many that can bridge both disciplines.

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Form Meets Function

Handout: Session 6, Activity B

In this activity, you will look at the clock radios closely and observe how the requirements are met.

1. Record the requirements that the class came up with for clock radios.
2. Choose one requirement and explain how five different clock radios met this requirement.
3. In pairs, consider one requirement and how you could improve upon it. Now, individually, draw a sketch of your ideal clock radio. This can be done in your design notebooks.

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Tick Tock: How a Clock Works

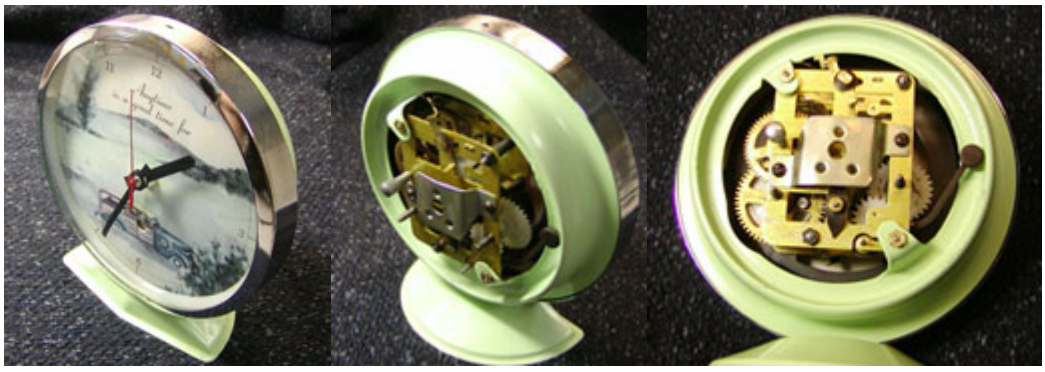
Handout: Session 6, Activity C

In this activity, you will have an opportunity to look inside clocks and see the inner workings of both mechanical and electrical clocks. As you examine the clocks, notice that they have the following:

- A source of power. In an electric clock radio, this is an electrical power supply, typically either a battery or 120-volt AC power from the wall. In a mechanical clock, the weights and springs provide the power.
- An accurate time base that acts as the clock's heartbeat. In an electric clock, there is a time base that "ticks" at some known and accurate rate. In a mechanical clock, the pendulum handles this.
- A way to gear down the time base to extract different components of time (hours, minutes, and seconds). In a digital clock, there is an electronic "gearing mechanism" of some sort. Generally, a digital clock handles gearing with a component called a "counter." In a mechanical clock, gears serve this role.
- A way to display the time. In a digital clock, there is a display, usually with either LEDs (light emitting diodes) or an LCD (liquid crystal display). In a mechanical clock, the hands and face do this.

Now identify the following components in the clocks:

- LEDs
- Wires
- Circuits
- Buzzer
- Speaker
- Belts
- Motors



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