Field Trip Lunch Design Challenge

Class: Foundations of Technology Education, Introduction to Engineering Design
Unit: Engineering and Design
Time:10-15 days

Setting the Stage for Problem Solving

Timeline: Day 1

1) **Scenario Introduction:** Perform skit in front of students. Rushing to pack the lunches. Storage and stacking. Transportation and distribution.

We are going on a field trip. We are going to get bag lunch from the school. What do we get? - (have students list the items - then add or modify to complete list) Place all the Items in front of them - now how do you get these to 70 students and on the bus - I the teacher have to do that. Brown paper bag. I am not a grocery guy and I have 10 minutes to pack 70 lunches with everything while still serving breakfast for the rest of the school. Start throwing in the items - sandwich, cheese, chips, and then chuck the fruit in. (break and crush chips) (Bag falls over, contents fall out.) Stand bag back up and roll it up. (bumpy ride - shake around) Turbulence mishandling - (drop bag a couple of times walking around the room.) Pull out the contents and open and show students. How many of you want a crushed PB & J? Open the bag of chips. How many of you want the crushed chips off the bottom of the pile of lunches? Who wants a bruised apple?

2) **Students work through Scenario** - Hand out paper bag for student observations
    a) Measure volume capacity
    b) Measure Surface area?
    c) It folds flat and assembled into volume
    d) Does not protect contents - contents on the bottom, 70 lunches in 1 box (-)
    e) Recycled and biodegradable (+)
    f) Inexpensive - limited material (+)
    g) Sturdy/stand alone - tippy, no lid, material relatively fragile (-)
    h) Unorganised - How do we know every lunch has what it needs? (-)
    i) Aesthetics - boring brown bag - ugly (-)

Timeline: Day 2

3) **Specifications of New Design - Develop Problem Statement**
    a) *Store flat
    b) *Recycling biodegradable
    c) *Ease of assembly
    d) *Appropriate volume to hold/store required contents
    e) Protect contents - sturdy, stacking, stand up
    f) Organizes contents - easy making/packing contents
    g) Activity or logo or _____ for aesthetics

4) **Sketching Activity**
    a) Sketching 101 - Monogram activity - Goal of Variety
    b) Video - Chip Fooses Personal Studio
    c) Sketching - Throwing lines, cubes eyes closed, shapes
    d) Thumbnail sketches - Small, crude, quick, detail last
    e) Sketch the paper bag - Rectangle - cube - shading - detail

5) **Brainstorm Solutions - Goal is variety and quantity**
    a) Brainstorm lunch container designs - students must have 20-30
    b) Use sketching techniques used above - Rest of class

Uncovering Details Through Reverse Engineering

Timeline: Day 3,4,5

Yesterday you have brainstormed some ideas for a new field trip lunch container. Many have pulled previous knowledge and designs from personal experiences. One of the more common techniques for gathering the information needed to define and solve problems is called reverse engineering. The following activity will introduce to you the nature of reverse engineering and ask you to investigate several containers used for holding food.

6) **Explore/Investigate Fast Food/Take out Containers**
    a) Domino's Sub Sandwich Box
    b) Dairy Queen Chicken Strip Box
    c) Kwikery Bake Shop Box
7) **Salient Impressions**
    a) Purpose - What is the purpose of the container? What does it need to do?
    b) Materials - thickness, strength, coating, etc.
    c) Appearance - Aesthetics, functions, activities
    d) Identification - identify the contents
8) **Functional Impressions**
    a) Grip - easy to hold onto and grip
    b) Fold Flat Design Features - Interlocking, Creases, Perforations, Tabs
    c) Stackability - Easy to stack and transport

Designers and Engineers do not rely solely on their subjective impression to improve existing designs or generate new designs. They often conduct precise tests that employ instrumentation to gather empirical data about the composition and performance of existing products. You have already collected baseline data

9) **Scientific Analysis**
    a) Functionality
        i) Ease of assembly
        ii) Security of Contents - stays enclosed, secured, latched
    b) Volume to Surface Area - Calculations, trade offs, optimum size to material solution
        i) Ratio - material used to assembled/enclosed volume
    c) Strength - How strong is it? - Hold up in the life of a student
        i) Textbook Testing - Hold up in a locker/backpack
        Safety factor, number of textbooks, inches of textbooks - 8"
10) **Comparative Analysis - Design Matrix**
    a)
11) **Redesign**
    a)
12)

My Engineering Notebook

1. What are the potential issues associated with field trip lunches?
2. What is the problem that has to be solved in the field trip lunch scenario?

3. What design specifications have to be met to solve the problem in question?

My Engineering Notebook - Salient Features