**FEC I INSTRUCTORS PLANNING TO UTILIZE FLASHLIGHTS AS A PRODUCT:**

**Oestreich - Team Lead**

**Instructor 2**

**Instructor 3**

**Instructor 4**

**PRODUCT ARCHAEOLOGY OVERVIEW:**

Product Archaeology is the process of reconstructing the lifecycle of a product, including the customer requirements, design specifications, and manufacturing processes used to produce it. It allows an individual to understand the decisions that led to a product’s development.

As a result, product archaeology offers students an opportunity to reconstruct and understand the mindset of designers in the time frame during which a specific product is developed. It is a recreation of the global and local conditions that led to its development.

Over the span of 4 weeks this Fall, 16 hours of combined “UnLecture” and Lab Time has been allocated to this Archaeology effort. As a refresher, each Section had 9 choices of Products to Evaluate:

|  |  |  |
| --- | --- | --- |
| Flashlights | Mugs & Cups | Speakers |
| Paper Towels | Shampoo | Diapers |
| Tennis Balls | Glue | Wrist-Mounted BP Monitor |

The Read.Me Document provides insight into the 4 Phases; however, I am providing a summary of them here again as reference:

* Phase 1: During the ***preparation*** phase, students reflect on what they know about the factors that impact the design of the particular product and postulate responses to questions about its design.
* Phase 2: ***Excavation*** activities lead to concrete experiences where students can physically dissect the product and perform appropriate research to develop well-reasoned answers to specific design-related questions.
* Phase 3: The ***evaluation*** phase provides opportunities for student to actively experiment and abstract meaning from their research and concrete dissection experiences.
* Phase 4: The ***explanation*** phase allows students to articulate their findings to describe the global, social, economic, and environmental impact of the product.

As we guide the Students through each Phase, we are asking them to consider 4 Overarching Areas to Address and Reflect Upon:

* Societal Impacts
* Economic Impacts
* Global Impacts
* Environmental Impacts

Now, with respect to the Flashlight Product Archaeology, we will be asking each Team to take a “Systems Engineering” Perspective / “Reverse Engineering” Point of View

* *What are the Requirements for this Flashlight?*
  + *Which ones are “MUST HAVE” requirements?*
  + *Which ones are “NICE to HAVE” requirements?*
* *Who are the Customers?*
* *What are the Social, Economic, Global, and Environmental Impacts of this Product?*
* *Examine its Design*
  + *How is it designed?*
  + *Why is it designed this way?*
* *Manufacturing Considerations – how is it produced?*
* *Design to Cost / Life Cycle Cost*
  + *What type of materials are used and are they the most cost effective?*
  + *Is it cheaper to discard the item if it breaks; or have it repaired?*
* *Distribution / Logistics Support*
  + *Is the product easily shipped and transported from Factory to Stores to Customers?*
* *Product Support*
  + *Is a User Manual / Instructions required?*
  + *When it breaks or stops functioning – what should the Customer do?*
    - *Discard and buy another*
    - *Call Customer Support to discuss options*
    - *Other?*
* *End of Life Disposition – what do you do with it when it is no longer needed / required?*

Hopefully each FEC I Section will not consist of more than 5 Teams. We have selected 5 Different Types / Designs of Flashlights that are easily ordered and relatively inexpensive.

* Each Team will evaluate their own unique Flashlight
* Each Team is expected to go through Research / Analysis into what it is and how it works
* Learn about things such as:
  + Human Factors
  + Performance
  + Cost
  + Manufacturing
  + Others…
* At the end of the final Phase, each Team will report out on their Findings
* As a guide, this should be a 6 PAGE, single spaced, written report
  + Introduction of the Product
  + One page for each Phase
  + One page for a Conclusion
* The written report should also include:
  + Relevant Charts / Graphs
  + Discussion of Test Results
  + How the Product could be improved and remain cost effective
* You might also consider having each Team provide an Oral Presentation during Class time
  + Allows them to see what the others have been doing and what conclusions they came to with similarly designed products

**PRODUCT ARCHAEOLOGY WEEK 1: PREPARATION**

We want the Students to think about the particular Product both as individuals and Teams; then they should be ready to move on and commence Research into the product. Finally, a Discussion centered around their Findings will help affirm they are heading in the right direction.

Thinking:

* Think Together
* Think Individually

Research Guidance:

* Is the research credible?
* Use Library Skills to do this
* Make an Opinion about it
* Research after discussions
  + Think about Connections and Linkages Individually
  + Discuss Connections and Linkages as a Team
* Can they find Spec Sheets / Performance Data / etc…

**PRODUCT ARCHAEOLOGY WEEK 2 and 3: EXCAVATION / EVALUATION**

* Identify/Develop Tests and Measurements
* Conduct Measurements
* Design of Experiments – provide the Teams with some general guidance; however, the intention is to have the Teams come up with their own ideas
* Data Collection and Recording
* Data Analysis
* Show How These Fit In (from PathFinder):
  + Graphs
  + Statistics

Safety Considerations

Aesthetics in Design

Destructive Testing can be completed; however, only if you believe it makes sense and is safe to do so

**Specific Testing Approaches for Flashlight Products:**

Determine the types of Testing / Experimentation the Students can do:

* Voltage
* Amperage
* Energy (amperage-hours of batteries)
* Dissection
* Duration
* Brightness
* Waterproof Testing
* Different Temperature
* Different Ambient Lighting
* Different Lighting Angles / Distances

Description should include a Features List

Team should provide a Functional Diagram of how it works

**TEST EQUIPMENT REQUIREMENTS FOR LAB TECHNICIAN PLANNING / SUPPORT**

When Teams perform ‘brightness’ measurements, you might have the Teams discuss and document the differences between **Lumens**, **Lux**, and **Candelas**; as well as which one they are measuring and how.

Our initial discussions suggested we reserve one of our ExEEd Conference Rooms for “X” Days to allow for Flashlight Testing without having to tear down any setups necessary for the different FEC I Sections. Additionally, we tasked Eric DuBois to design an ‘enclosure’ that would allow for the Flashlight to be placed into (black box) with the Light meter at one end. We would have a Sensor inside the box with its associated readout outside the box to minimize any interference.

ASTM Standard Illumination Test – Investigate ASTM F2964 - *Standard Test Method for*

*Determining the Uniformity of the Luminance of an*

*Electroluminescent Lamp or Other Diffuse Lighting Device*

Or find an alternative accepted form of Testing

**PRODUCT ARCHAEOLOGY WEEK 4: PRESENTATION**

* Go from Reverse Engineering to Next Steps
* Explicitly tell them what to do next
* Summarize what they did
  + 6 PAGE Technical Report
  + Oral Team Presentation in Class
  + Focus on Charts / Figures
* How to Make It Better?
  + What would your team do?
  + Consider and Address the 4 Areas
    - Societal
    - Economic
    - Global
    - Environmental

**FLASHLIGHT CONFIGURATIONS TO EVALUATE**

BYB Super Bright 9 LED Mini Aluminum Flashlight

Bolayu CREE XPE-R3 LED 1000 Lumens Mini Penlight

UltraFire 7w 300lm Mini Cree LED Flashlight

BYBLIGHT Small Flashlight with Colored Band (Zoomable)

LuxPower Tactical V1000 LED Flashlight

Dorcy – LED Super Glow Stick (Potential for Evaluation)