Context

Design Criteria

Ingredients

Packaging

Projections

Logo

LATHER LATTE

An affordable jolt of energy with every wash

QR Code

[iPad playing video mounted here]

Raw Data

Soap Calculator Screenshot

Options and Iterations

As Designed vs As Made

Economics

Branding Rationale

- The scent of coffee is not common, showing uniqueness
- Coffee is synonymous with how people start their day, and our brand wants to make our customer's days starting right.
- High quality soap properties, but still affordable
    - Good for university students
- Affordability allows for a large market
- Low production cost allows for large yields

Context

Evidence of soap making dates as early as 2800 B.C. with the Babylonians. It wasn't until World War I when the modern soap we use today was created with a variety of synthetic compounds. Today, soap is part of a much larger market; one which further divides soap into based on its properties (i.e. bar or liquid) and uses (i.e. cleansing or cosmetic). The soap market also entails dish detergent and laundry detergent.

In essence, saponification is the reaction between an acid and a base to form a salt. Typically, soap is made by mixing an oil or fat (i.e. the acid) with Sodium Hydroxide or Lye (i.e. base). Different oils and fats combine uniquely with the base which can favour one property or another. Commonly measured soap properties include: hardness, cleansing, bubbly lather, creamy lather, and conditioning.

Soap functions by reducing surface tension. This is important as high tension causes water to form beads on surfaces (i.e. a drop of water will hold its shape), which slows wetting of the surface and inhibits the cleaning process. Moreover, soap has a unique hydrophobic tail composed of fatty acids which are essentially long chains of hydrocarbons and a hydrophilic head composed of a glycerine molecule with a polar carboxyl group. This dual property helps form micelles in an aqueous solution to effectively cleanse.

Design Criteria

Product Quality

In creating this soap, we aimed to have a high-quality, high-end product that would be an affordable luxury to anyone seeking a product that was inexpensive, yet lavish and with good results. When creating this soap, we were tasked with creating as good of a soap as we could, and we did just that.

Material Selection

As said in the *Ingredients Rationale,* we chose our ingredients in hopes of creating a soap that did its job exceedingly well, and so we chose materials that had high cleansing power and were still affordable. We did so by using our soap calculator, which is illustrated on the right side of the board.

Process Selection

The process that we chose was a cold process. Even though we heated up the oils so that it would melt more quickly, and the NaOH did produce heat when reacting with water, we did not heat up the soap specifically. The cold process was said to be the safer of the soap making methods, and therefore was one of the other reasons as to why we chose this process.

Mold Selection

The molds were chosen due to their desired shape, as well as the accessibility of them, and the fact that they allowed for the bars of soap to be cut in two, which gave the desired size of product that we were aiming to achieve.

Ingredient Rationale

- 500 grams of oils
  - **140 grams of coconut oil**
  - **45 grams of ghee**
  - **315 grams of Crisco:** High conditioning properties and low cost

37% of the soap composed of these ingredients due to effective cleansing properties despite relatively high cost

- **72.1 g lye (NaOH):** Lower cost and less heat created during reaction than KOH
- 190 g distilled water
- **2 g coffee grounds:** Exfoliant
- 15.5 g fragrance
  - 3.75 g pure vanilla extract
  - 11.25 g French vanilla

Packaging Rationale

- The design is simplistic as to appeal to the unanimous desired "aesthetic" of today's society.
- A gold, deep red, brown and black colour scheme is applied that follows the latte ideal, creating a monochromatic and warm feel to the brand
- Simple, type-writer font used on the label as to build on the "coffee-shop" feel.
- Recycled paper is used as to be conscious of the environment, using little to no plastic other than the sticker label.
- The packaging takes into consideration the design principles of green engineering, as its design is durable instead of immortal.

Soap Calculator Explanation

The soap calculator was created based on the table made earlier and has three parts.

Overview

- 1. The name of the oils that we can use.
- 2. The amount of KOH/NaOH that is needed for saponification.
- 3. The amount of different acids in each soap.
- 4. The properties of the oils.
- 5. The price for the oils.

1

- The first part of the calculator allows people to enter the percentage of each oil, as well as the total mass of all oils. Then, it will calculate the mass of the individual oils.
- The green cells are the cells that allow users to input their data.
- The name of the oil uses data validation to make sure only the oil listed on the previous table can be entered.

2

- The second part of the Soap Calculator uses the V-lookup function to find the names of the oils.
- Next, it finds the amount of NaOH/KOH to mix with 1g of that oil.
- It also determines the price for 1g of oil and multiplies it by the mass of the oil.
- It also finds the "score" for each properties of the oils, a higher score means the soap is better at that property.

3

- The third part of the Soap Calculator can be used to calculate the needed amount of oil.
- It adds up the "score" of each properties of the soap from the table above.
- The user can input the desired property score in the desired row and the optimal percentage of oil will be automatically calculated.

Our Soap Calculator

1

	Soap Optimizer		
2			
3	**Oils**	**Percentage**	**Quantity(g)**
4	Coconut Oil, 76 deg	28%	139.710
5	Ghee, any bovine	9%	45.290
6	Crisco, old	63%	315.000
7	Avocado Oil	0%	0.000
8	Olive Oil	0%	0.000
9	Sesame Oil	0%	0.000
10	Corn Oil	0%	0.000
11	Grapeseed Oil	0%	0.000
12	Sunflower Oil	0%	0.000
13	Canola Oil	0%	0.000
14	**Total**	100%	500

2

	Contribution to Overall Soap Recipe and Properties							
Oils	**SAP(NaOH)**	**SAP(KOH)**	**Hardness**	**Cleansing**	**Bubbly Lather**	**Creamy Lather**	**Conditionning**	**Cost**
Coconut Oil, 76 deg	25.5669194	35.90545505	22.07417081	18.72113	18.7211322	3.353038604	2.794198836	0.4555
Ghee, any bovine	7.33698943	10.28084321	4.9819064	1.358702	1.358701745	3.623204654	1.99276256	0.1513
Crisco, old	43.155	60.48	16.38	0	0	16.38	44.1	0.2646
Avocado Oil	0	0	0	0	0	0	0	$ -
Olive Oil	0	0	0	0	0	0	0	$ -
Sesame Oil	0	0	0	0	0	0	0	$ -
Corn Oil	0	0	0	0	0	0	0	$ -
Grapeseed Oil	0	0	0	0	0	0	0	$ -
Sunflower Oil	0	0	0	0	0	0	0	$ -
Canola Oil	0	0	0	0	0	0	0	$ -

3

Mass of Oil (g)	500							
Percentage of Water as a Percentage of Oils	38%							
Mass of Water(g)	190							
	SAP(NaOH)	**SAP(KOH)**	**Hardness**	**Cleansing**	**Bubbly Lather**	**Creamy Lather**	**Conditionning**	**Cost**
Totals	72.0904575	106.6662983	43.43607721	20.07983	20.07983395	23.35624326	48.8869614	$ 0.87
	Reccommended Ranges		29-54	12-22	14-46	16-48	44-69	
	Targets		42	17	30	32	52	0
	Significance		1	1	1	1	1	1
	Objective Function		-16.29					
	Coffee grinds and vanilla is going to be added to enhance the smell of the soap and increase nutrients							

Options

The soap calculator is designed so the user can design the soap they want by simply modifying a few numbers. The equation used in the soap calculator is: **(Hardness Level-Hardness Target)**$^{\text{Hardness Significance}}$ **+ … + (Conditioning Level-Conditioning Target)**$^{\text{Conditioning Significance}}$ **+ (Cost-Cost Target)**$^{\text{Cost Significance}}$

The soap calculator will find the minimum value of the equation by modifying the percentage of each kind of oil in the soap. There are two main options for the user to edit the soap calculator. If the user wants the soap to be hard, he/she can increase the Hardness Target. If the user wants the soap to be soft, he/she can decrease the Hardness Target. This applies to all other properties. If the user feels one property is more significant than the others, he/she may increase its significance. By doing that, the difference between the level of that property and the target level of that property will have a bigger impact on the equation.

Iterations

Criteria	Ideal Range	Weighting	30% Coconut, 1% Ghee, 69% Crisco	28% Coconut, 9% Ghee, 63% Crisco	22% Coconut, 9% Canola, 69% Crisco
Affordability	0	4	$4.52 per 500 g	$4.35 per 500 g	3.85 per 500 g
Cleansing	20	3	19.99	20.07	14.74
TOTAL			**417**	**358**	**365**

Soap Calculator: As Designed vs. As Made

The soap we made and the soap we designed have similar properties but were not the exact same.

Similarities

- Almost all the materials determined in the soap calculator were used in the soap that was made, the only one not in both being the coffee grounds that were included in the actual soap.
- The prices determined within the soap calculator were accurate when compared with the soap created.

As Designed

- The designed soap had certain calculated properties that were 'ideal'. The calculator displayed masses to a precision of three decimal places.

As Made

- The overall mass of each soap bar is not exact due to mass loss during carving and transportation.
- Since it is very difficult to get the exact mass that the recipe called for using the materials that we had, the mass of the oils that were used differed slightly (error of +- 0.5g)
- Uneven distribution of coffee grounds may have occurred since the layer was not initially weighed.

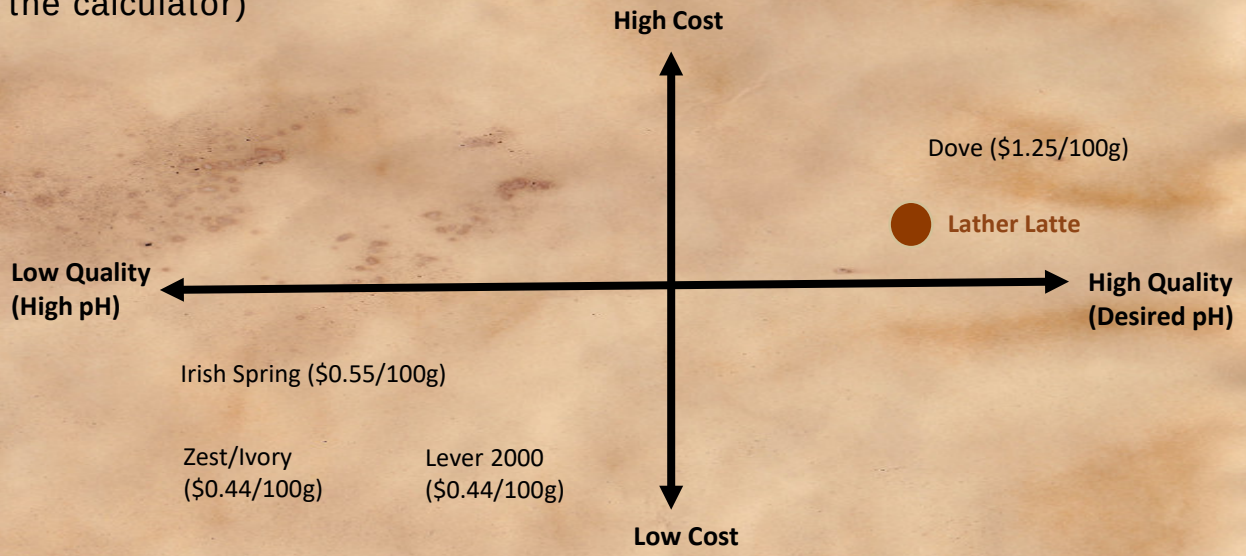
Pricing

- Cost of oils/soap bar: $0.50 (as per the calculator)
- Cost of NaOH/soap bar: $0.30
- Cost of additives/soap bar: $0.20
- Cost of packaging/soap bar: $0.05

Our Price:

$2.00

($0.95 earned per soap sold)



SOURCE: https://bellatory.com/hygiene-grooming/healthy-skin-the-ph-balance-of-popular-bar-soaps

Projections

1-Year

- Perform generation-consumption analyses by setting up a stoichiometric matrix to maximize the atom economy fraction - tweak recipe and assembly line concerns accordingly
- Optimize packaging (i.e. biodegradable plastic cover) to better protect soap for transportation while minimizing excess and taking the commercial “afterlife” into account

3-Year

- Begin R&D for replacement of NaOH with a less toxic substance without compromising quality
- Launch new products – different sizing and possibilities for redistribution (e.g. gift bags)

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