

# PRELIMINARY DESIGN CONCEPTS, CHEM E 486

Purpose of this Document: To provide useful guidelines for systematically moving toward a unique product that is well-suited to a specific marketplace need.

## Elements of the Report

### 1. Introduction to the market you propose to enter

Provide some insights into the market you propose to enter and your rationale for selecting that market. Suitable background material might include some quantitative traits of the market, likely routes for disseminating your product, any competitors, and identify all the stakeholders in the product (those who pay for the product, those who use the product, those who certify the product's suitability for use, etc.).

Conclude this section by specifically stating what the product seeks to accomplish:

“Specifically, we seek to design a product that will vividly illustrate the respiration cycle in plants, and will be suitable for the 3-5 grade market.”

### 2. Mapping stakeholder needs to engineering characteristics

This step in the design of a product converts what the product stakeholders say their needs are, to the quantitative engineering traits you can design into the product. Here is an example,

Stakeholder needs:	Cheap Very engaging Fills multiple needs in curriculum Needs be usable for 7 years Does not require much instructor time for set-up or stocking Safe ...
Engineering traits:	Price <\$10.00 each •Definition of a “cheap” capital investment for market X Reagents <\$2.00 each •Makes product cheap to operate •Refills permit product to be reused Reagent Shelf-life>9 months •Helps make cheap •Fills multiple needs in curriculum •Requires less instructor time Product is assembled by students with customization options •Makes product cheaper •Makes product more engaging 99% experiment success rate when operated by students

- Makes a more engaging product
- Requires less instructor time
- More likely to last 7 years

Results presented in the form of a human sensation (Sound > 70 db, colors with OD $\geq$ 1, smell, taste, or tactile sensation)

- Helps makes product engaging
- Helps makes product cheap

Reagents are certified sewer-safe

- Cheap
- Safe

...

The needs and traits are normally presented as a matrix, with explanations and rationale for each trait explained in an accompanying narrative.

### 3. Benchmarking

Describe any products that currently exist in the market you seek to enter, and clarify the extent to which they satisfy the Stakeholder Needs.

### 4. Brainstorm a bunch of product concepts (maybe >5)

Be totally creative and don't worry if you think the idea is too expensive or too tough to fabricate. Just do your best to come up with as many ideas as possible. Pick five or more and sketch them out by hand or on the computer. (If by hand, include scanned images in the electronic report). Give a few sentences of description for each concept—just enough so I can get the gist of what you were thinking.

### 5. Functional Decomposition

Now that you have some wacky design concepts, identify the common functional traits among the designs (just like we did for whole lab-on-chip modules, though your may differ somewhat since you have education as the ultimate objective of your device).

Each generic “function” is an area where we can look to optimize the design to best satisfy the engineering traits identified above.

### 6. Preliminary project timeline

Indicate expected tasks needing attention during the quarter and when they need to be completed. In greater detail, propose tasks to be completed by each person in your team for the two lab sessions immediately following this report.

The report is due April 23, 4 pm for Tuesday Sessions, and April 26, 4 pm for Thursday Sessions. Please submit an electronic version to the instructor and TAs.