



BME 590: FUNDAMENTALS OF
ENGINEERING DESIGN

EVALUATION

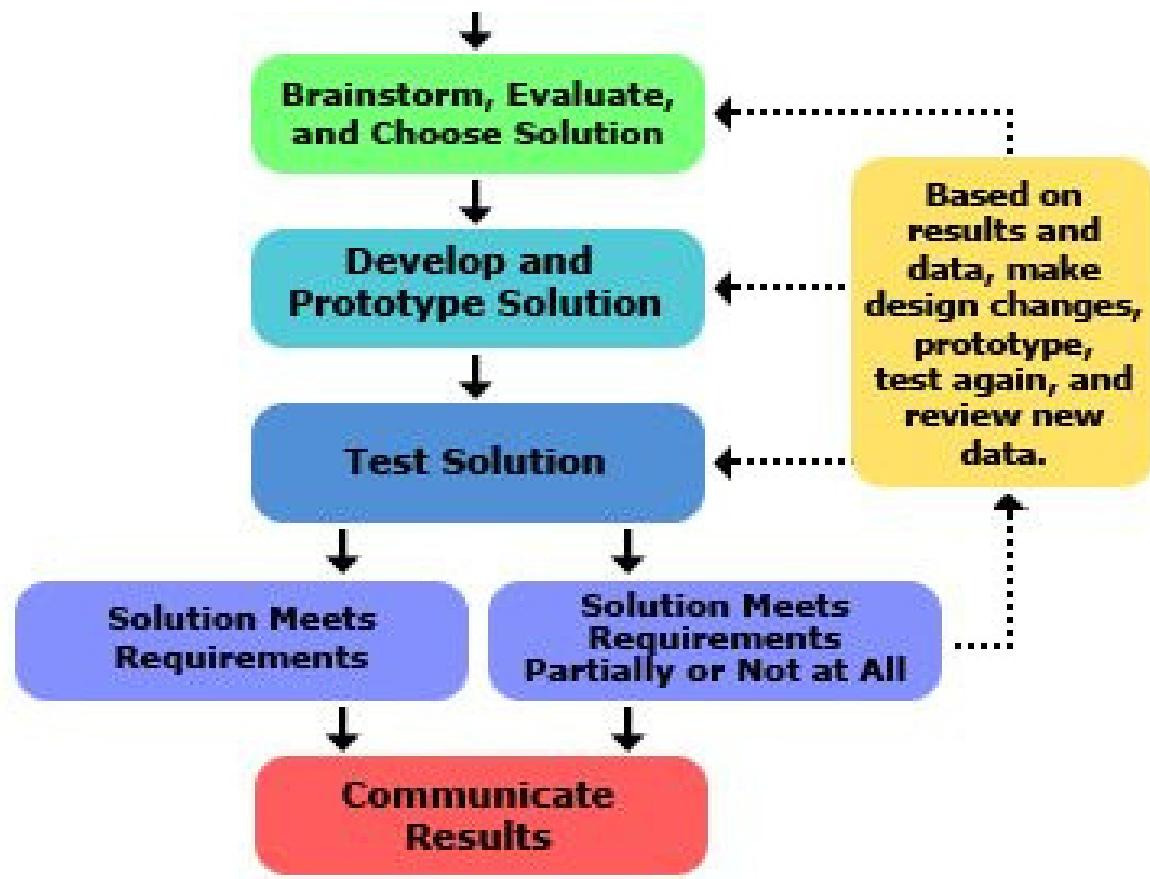
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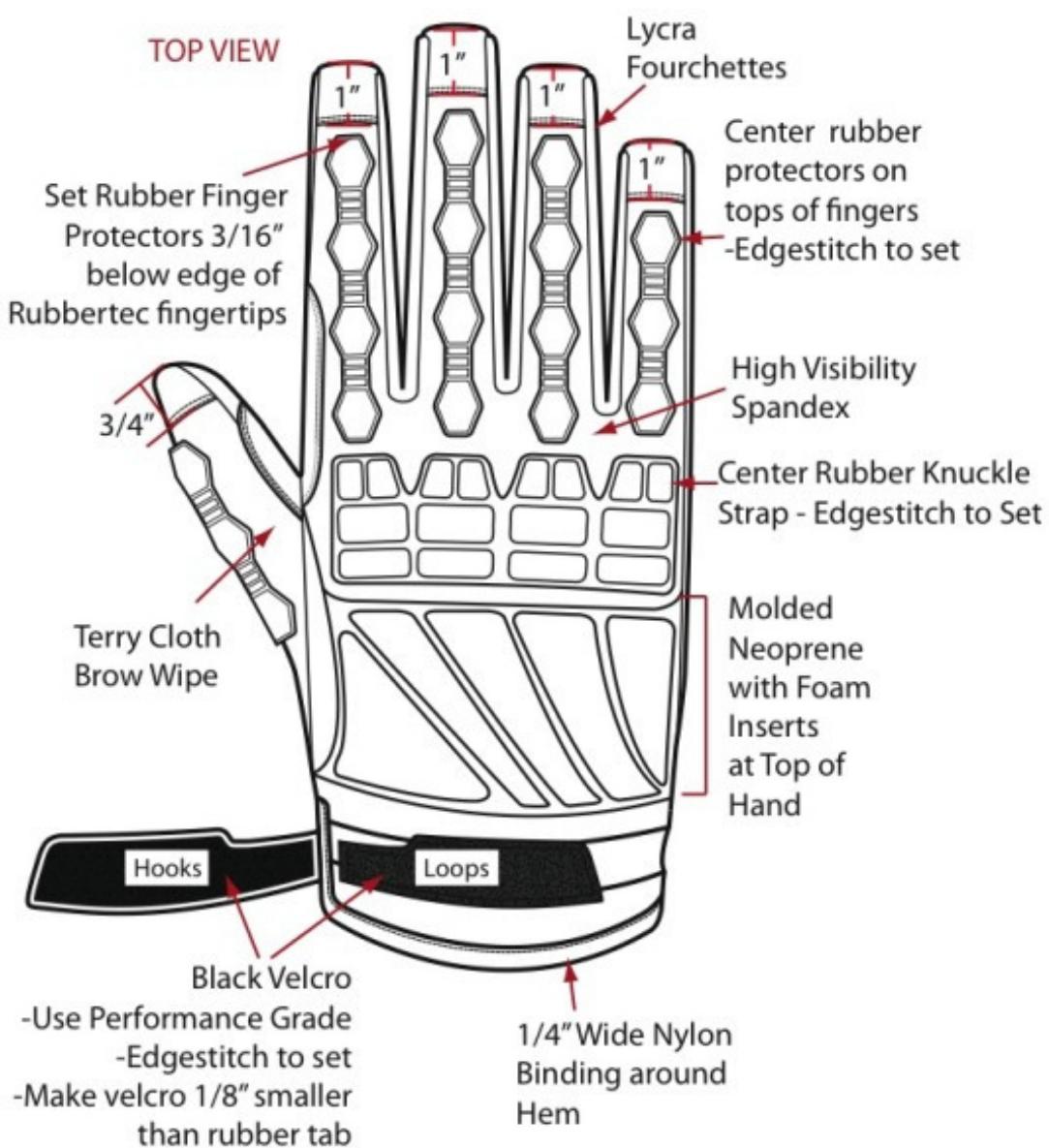
WHAT IS AN EVALUATION?

Strategy to:

1. Verify
and
2. Validate

your device meeting
your design specs





DESIGN SPECS ARE:



DEVICE REQUIREMENTS



PERFORMANCE CRITERIA



SAFETY



EVALUATION

EVALUATION

DESIGN SPECS FOR DEVICE
EVALUATION



**IDENTIFY MEANS
FOR VERIFICATION
OF SPECS**



**IDENTIFY MEANS
FOR VALIDATION OF
SPECS**

**WHAT TESTS AND TESTING
RANGES WILL BE OF USE TO
PROVE YOU'VE MET YOUR
SPECS AND CLIENT NEEDS?**

EVALUATION

DESIGN SPECS FOR DEVICE
EVALUATION



VERIFICATION:

CONFIRMATION THAT SPECIFIC
REQUIREMENT HAS BEEN
FULFILLED



REQUIRES OBJECTIVE EVIDENCE



TYPES OF TESTING:

- DIRECT VS. STANDARD
- SURROGATE VS. STANDARD
- BENCH TOP TESTS
- COMPONENT ANALYSIS

EVALUATION

DESIGN SPECS FOR DEVICE
EVALUATION



VALIDATION:

CONFIRMATION THAT
REQUIREMENT FOR SPECIFIC
INTENDED USE ARE CONTINUOUSLY
MET



REQUIRES OBJECTIVE EVIDENCE



TYPES OF TESTING:

- DIRECT VS. CONSTRUCTED
- CONSTRUCTED VS. SURROGATE
- USER TESTS
- METHODS FOR USER TESTING
(E.G. LIKERT, FOCUS GROUP, ETC.)

Example of SPG for Neater Feeder Device

**Our client desires to take a
more active and independent
role in her eating**



Goal: To help Mary eat more independently

Main Features:

Guide right arm to mouth

Improve ability to hold a utensil

Provide stability

Allow Mary to sit at table with other people

Example of Verification and Validation Plan for Neater Feeder Device



Example of Design Specs and Evaluation Table for Neater Feeder Group:

Requirement	Performance Criteria	Verification Plan	Validation Plan
Client must be able to use device for an entire meal	Device must be usable for a thirty-minute meal.	Team tests eating with device for thirty minutes.	Observe client using the device for a thirty-minute long meal and solicit feedback through a questionnaire after long-term testing.

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Must be portable	Device must weigh less than 20 lbs. and must be 3.5 feet by 2 feet.	Weigh and measure each component to ensure they do not exceed size and weight requirements.	Observe client's caretakers carrying device from storage location to table and back.

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Must decrease assistance from caretaker	Device must decrease outside assistance by 50%	Testing demonstrating that team member and outside participant can eat independently with device.	Observe client moving food from plate to mouth and receive feedback from surveys. Analysis on the quantity of outside assistance necessary over a meal with the device.

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Ease of setup	Caretaker must take less than 2 minutes to set up.	Quantify how long it takes for the team to set up device.	Observe client's caretakers setting up device and solicit caretakers' feedback (verbally and from questionnaire).

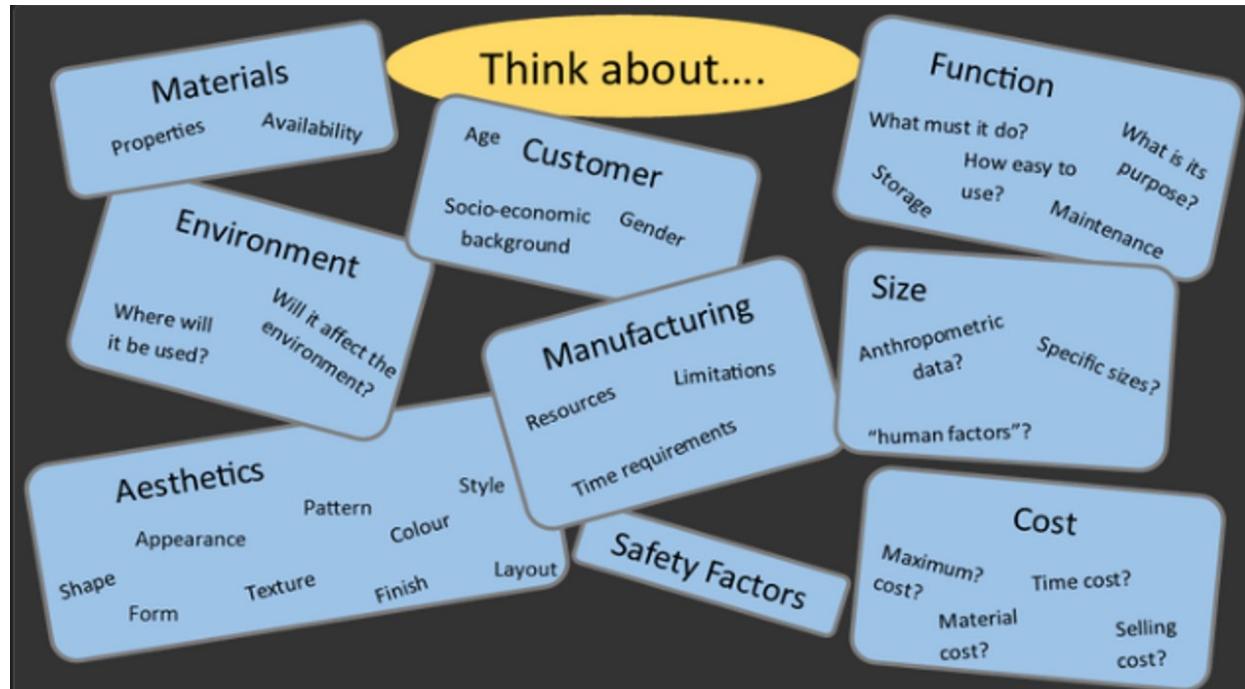
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Ease of setup	Caretaker must take less than 2 minutes to set up.	Quantify how long it takes for the team to set up device.	Observe client's caretakers setting up device and solicit caretakers' feedback (verbally and from questionnaire).
Damping is not too strong for client	Damping on device must not exceed client's maximum strength (horizontally 20 lbs. and vertically 11 lbs.).	Quantitative analysis demonstrating that dampers do not exceed maximum allowed force.	Solicit feedback through a questionnaire after long-term testing.

YOUR GOAL:

- 1. Revisit Design Specs**
- 2. Develop which tests require which methods (Testing Lec.)**
- 3. Prepare Verification and Validation Plans for your Specs**



Remember Specs are:

- Understandable by designers and customers
- Specifies the system behavior
- Describes what is done or required, but not how
- Complete, unambiguous and testable

Remember Verification and Validation Plans:

- Measurable and specific
- Involve quantification, observation, material selection, etc.