

INTERFACES & WORKS-LIKE PROTOTYPES

WEEK 8, PROJECT DAY 1

AWARENESS TRAINING

All know the way; few actually walk it.

-Bodhidharma

Who is wise? One who learns from all.

- THE TALMUD

Nothing great is created suddenly, anymore than a bunch of grapes or a fig.

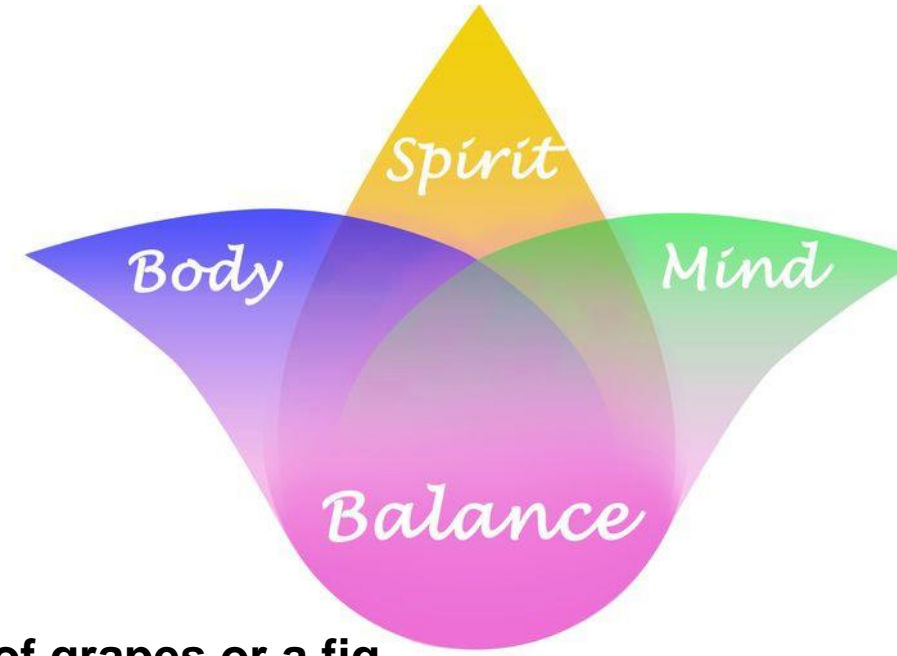
If you tell me that you desire a fig, I answer you that there must be time.

Let it first blossom, then bear fruit, then ripen.

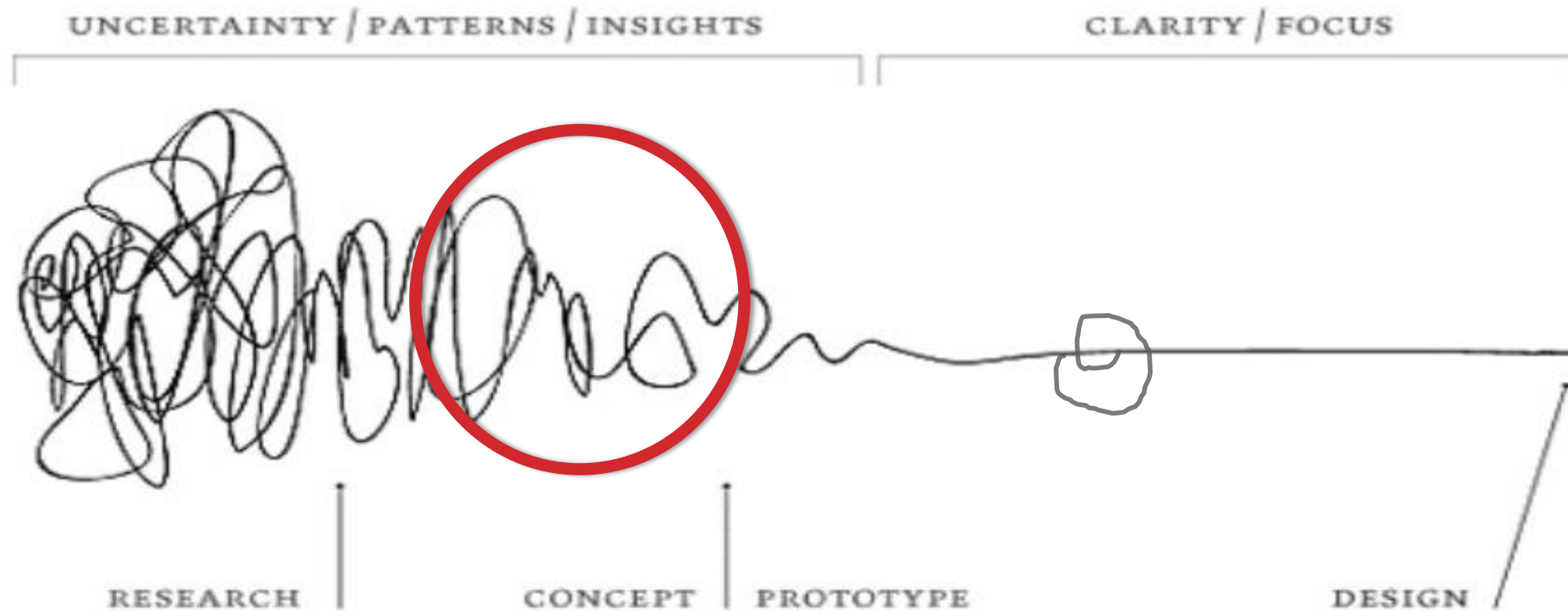
- EPICTETUS

Perseverance is more prevailing than violence;
and many things which cannot be overcome when they are together,
yield themselves up when taken little by little.

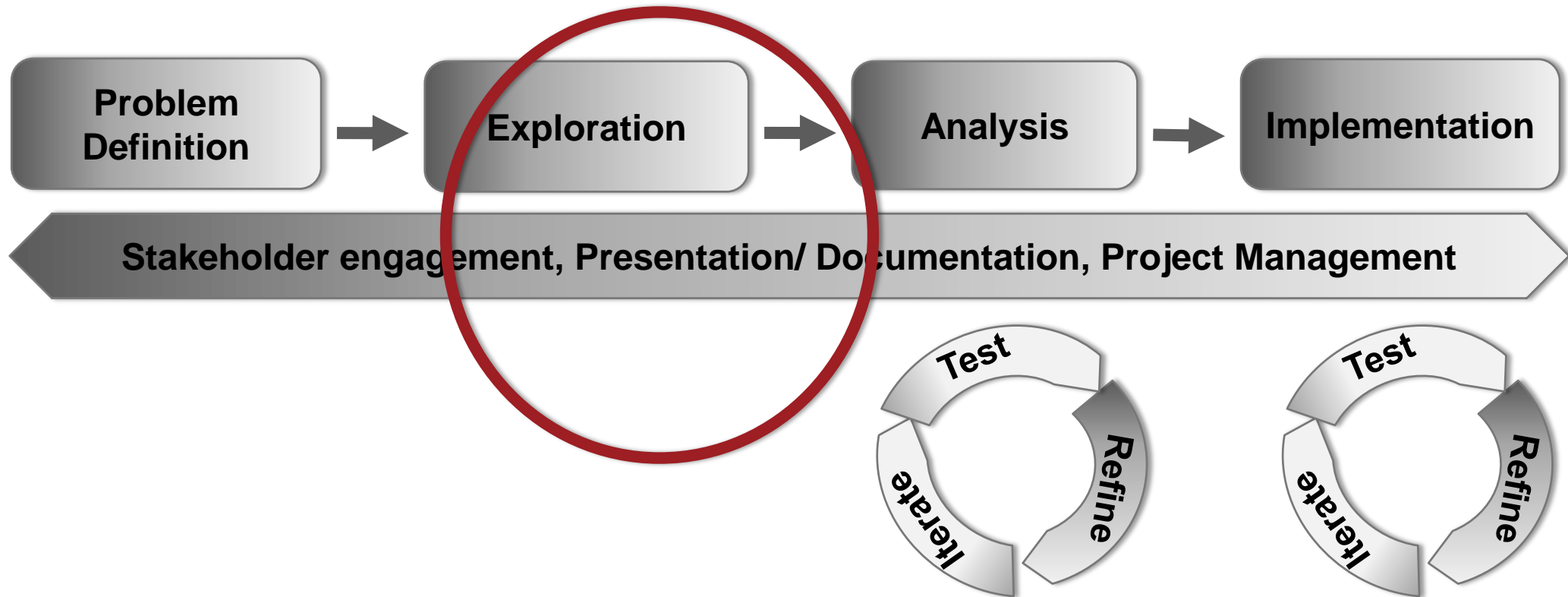
- PLUTARCH



WHERE ARE WE IN THE DESIGN PROCESS?



WHERE ARE WE?



REPEAT: *EACH OF YOUR CONCEPT SUBSYSTEMS*

Is a component of your solution...

...that requires detailed design/analysis...

...to ensure that it functions as planned *(or even better...)*

It is fully described so that it can be built, and,

... together, your subsystems fully describe your entire solution.

→ Note: You will each write a report describing one subsystem (due week 11)

REPEAT: *YOUR SUBSYSTEM DESIGN MUST...*

- Meet client's requirements
- Be definitive (dimensions, materials)
- Be based on calculations
- Be consistent with the other subsystem designs within your team **(interfaces...)**

SO THEN. WHAT ARE INTERFACES?

Things which are true at an interface :

- Coincident location of items
- Continuous structure or function
- Identical “forces” act on each subsystem

INTERFACE COORDINATION

Why is it necessary?

Why is it a big deal?

WITHOUT COORDINATION...

YOUR SUBSYSTEMS MIGHT VIOLATE PHYSICAL PRINCIPLES



Cozy, eh?

WITHOUT COORDINATION...

YOUR SUBSYSTEMS MIGHT NOT FIT SO WELL TOGETHER



WITHOUT COORDINATION...

YOUR SUBSYSTEMS MIGHT NOT FUNCTION SO WELL TOGETHER



COORDINATION AFTER THE FACT



*Just
isn't as
good!*

MORE SIGNS OF COORDINATION AFTER THE FACT...



TEAM TIME

- **What interfaces must exist between your subsystems?**
 - What does this mean in terms of how you might work together?
 - What does this mean for your Project Plan?
- **Continue work on determining ways to accomplish the functionality of each subsystems**
 - Brainstorm at LEAST 5-6 ways each

WORKS-LIKE PROTOTYPES

TWO PROTOTYPES IN EPICS I

“Looks-like” prototype

- Due Week 7, with Design Proposal

Sketches

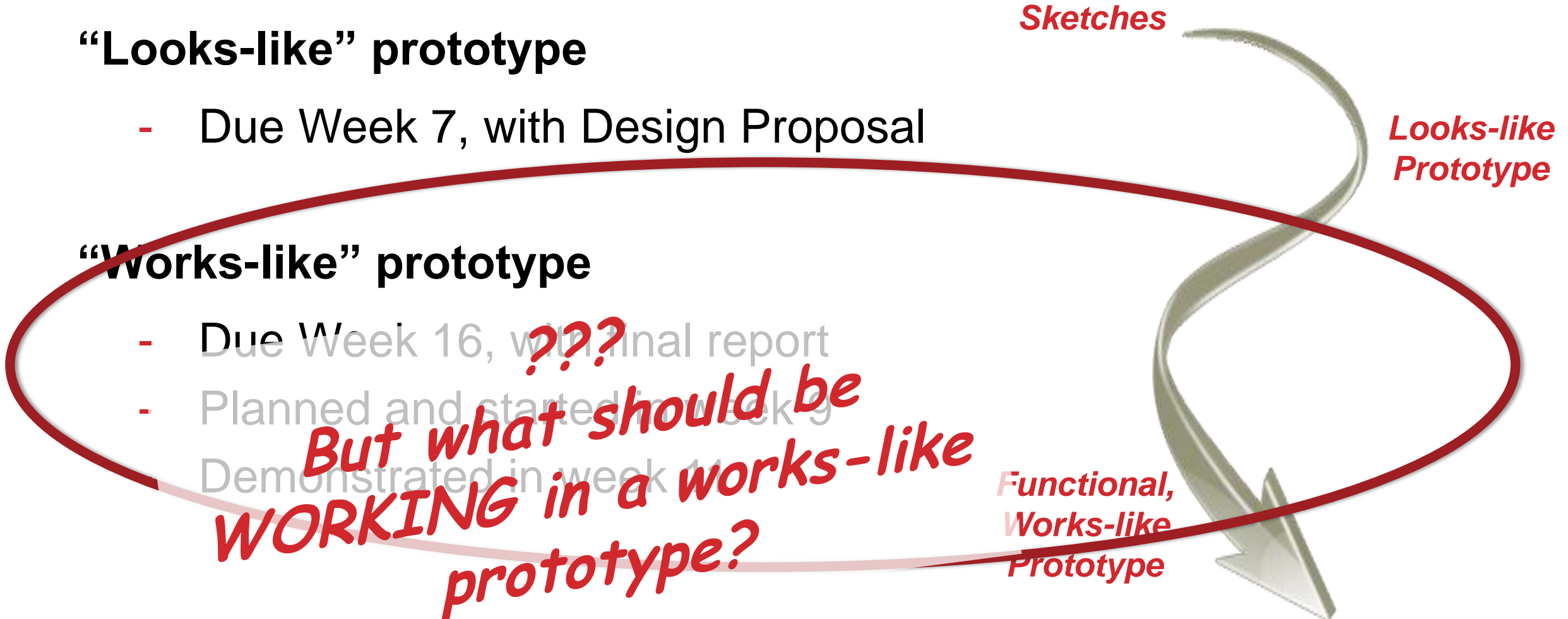
*Looks-like
Prototype*

“Works-like” prototype

- Due Week 16, with final report
- Planned and started in week 9

*But what should be
WORKING in a works-like
prototype?*

*Functional,
Works-like
Prototype*



I'M GLAD YOU ASKED...

...You will demonstrate some level of functionality of your planned subsystems in week 10 (*starting October 25*)

The final prototype testing will be week 14 (November 22)

Sketches

*Looks-like
Prototype*

*Functional,
Works-like
Prototype*



REVISIT: **WHY PROTOTYPING?**

- A prototype is a conceptual model of your solution
- It's often a **PARTIAL** representation of your solution
 - What part of your solution do you need to focus on?
 - What details are extraneous? (*Leave those out...*)
- The specific purpose of your prototype will indicate what part of your solution you prototype

???

OK, but how do you decide?

REVISIT: **WORKS-LIKE PROTOTYPE**

Also known as: engineering model, proof-of-concept model

Purposes:

1. To evaluate technical feasibility of your solution
2. To force yourself to make choices
3. To provide tangible expression of your concept
 - Stakeholders' inputs
4. To incorporate feedback into your next iteration
 - This gets you even closer to a good solution

SHOULD I PROTOTYPE IT? ASK YOURSELF...

What is self-evident, or already validated in the world?

→ Don't prototype wheels, a pump, a drip line, a fish tank...

Does it need to be validated, but cannot be physically tested on campus, or in this class?

- *Eg, a 1-acre greenhouse*

→ Change the scale to test, and focus on the “new” parts that need validation

Does it need to be validated, but cannot be physically tested b/c of cost, safety, limitation of material access?

- Eg; animal tests, major chemical reactions

→ This needs to be researched thoroughly in your subsystems analysis report.

TEAM TIME

Make lists with your team:

What are the most important functional aspects of your solution?

What part(s) of your subsystems do you need to figure out better?

What part(s) needs proof of feasibility?

On which part(s) do you need stakeholder feedback?

→ And, what details can be left out?

Make a list of this, too!



10-15 minutes

Check your plans by your mentor

PROTOTYPE DEMONSTRATION – FIRST TRY

- **Due the Week of Oct 24 - What is it?**
 - For each of your critical components, getting the wheels turning on testing.
- **Does it have to be refined? NO**
- **Do the pieces have to integrate? NO, NOT YET**

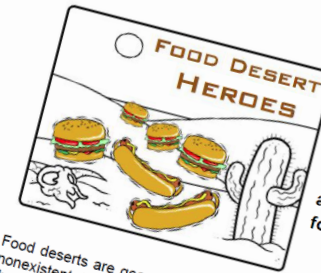
Who is wise? One who learns from all.

– THE TALMUD

CONSTRAINTS FOR YOUR FINAL WORKS-LIKE PROTOTYPE

Call for Proposals:

- \$100 limit for final works-like prototype
- No dimension to exceed 3'
- Check for others...



Call for Proposals EPICS 151 Fall 2016

Food Desert Heroes (FDH)* is seeking proposals for novel technological approaches to empower individuals and families living in concentrated urban areas to grow their own supplemental supply of fresh food.

Food deserts are geographic areas where people's access to affordable, healthy food options is restricted or nonexistent due to the distance or absence of mainstream grocery stores¹. While food deserts still have food, there is an imbalance of food choices, meaning a heavier concentration of processed, packaged foods that are high in salt, fat, sugar and devoid of nutritional value. These "fringe foods" come from fast food restaurants, convenience stores, gas stations, discount bakeries, and liquor stores².

It is estimated that 23.5 million people (7.4% of the total population) across the US live in food deserts³. Nearly half of all people in the US living in food deserts are low-income, and are commonly communities of color. Coupled with the fact that healthier foods are typically more expensive than unhealthy foods, healthy food options are often entirely beyond the monetary means of many of these communities. Even if families are receiving food stamps from the USDA's Supplemental Nutrition Assistance Program (SNAP), access to mainstream grocery stores is still restricted. In some areas like Detroit, the vast majority of food stamp retailers are convenience stores, liquor stores, and gas stations⁴.

What we eat is directly correlated to our health. The US spends \$150 billion annually to treat diet-related diseases annually. Occurrences of diabetes in the US have tripled over the past decade, and currently 1/3 of all children in the US are obese or overweight⁵. Consequences of long-term constrained access to healthy foods is one of the main reasons that people of color and low-income populations suffer from statistically-higher rates of obesity, type 2 diabetes, cardiovascular disease, and other diet-related conditions as compared to other populations¹.

This Call for Proposals focuses on the need to empower individuals and families living in concentrated urban areas to grow their own supply of fresh food to supplement the food they may or may not be receiving from other initiatives and organizations as well as that which they purchase.

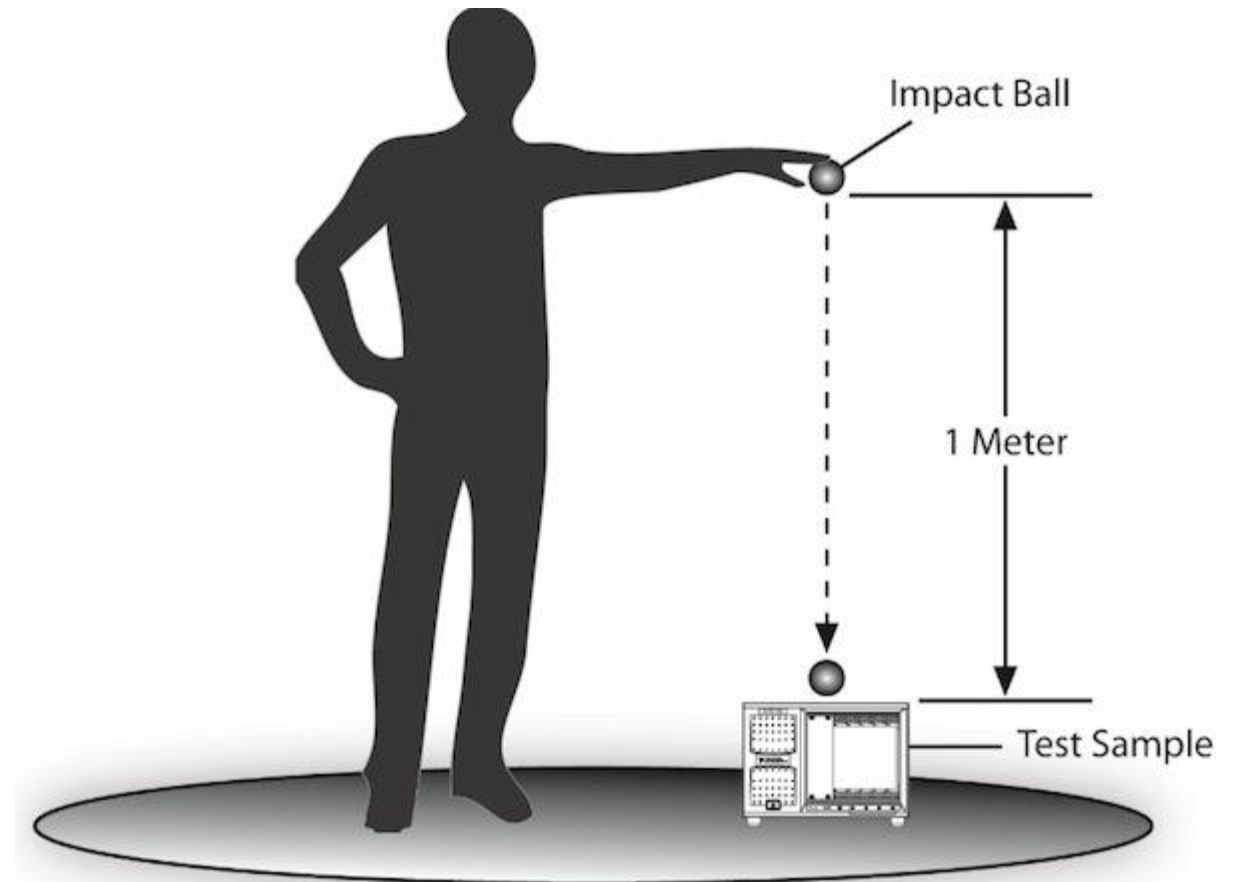
Solution requirements

We invite proposals that present compelling solutions for an individual or small family to grow a supplemental supply of fresh food by means of a food-production system that can be implemented in small locations without direct access to ground soil (meaning seeds cannot be sown directly into the ground).

- We will prioritize sustainable, human-centered, and scalable solutions.
- The solution should be designed with a specific stakeholder group in mind, assume implementation in Golden or the surrounding areas.
- The course does not allow the time to grow and harvest crops of vegetables or raise animals to maturity. However, through research, testing, and prototyping, teams should determine the quantity, type, monetary value, and energy value of the food to be produced. **At least 3 types of food must be produced.**

SO, BEFORE YOU DESIGN YOUR PROTOTYPE...

... You design the test.



NEXT DELIVERABLE: TESTING PROTOCOLS

Guidelines and Rubric will be posted on
Blackboard – Review before Next Class

Includes:

1. Testing protocols (and/or Research plan)
2. Testing safety plan
3. Plan for feedback



COMING UP

Project Day 2:

- Works-like prototyping, and Testing Protocols assignment
- Risk Analysis
 - **HOMEWORK:** Read 1-pager on risk assessment matrix. Identify one industry accident or Darwin award. In your **Design Log:**
 - Describe the accident, identify 4-5 reasons why it happened.
 - Plot each reason on the risk assessment matrix.
 - How could the risks have been reduced?
- 360 evaluations, participation grade evaluations

NEXT CLASS*: PARTICIPATION GRADE EVALS

5 points assigned in week 8

5 points assigned in week 16

3 parts:

- **Engagement – active in class, design log, pre-work? (3 pts)**
- **Relevance – comments in class (1 pts)**
- **Respect – respectful to others perspectives? (1 pts)**

****SOME IN CLASS, SOME OUTSIDE OF CLASS***