Engineering Everywhere

David Syracuse, New Visions Engineering
TST BOCES, Ithaca, NY

ABM
ABM

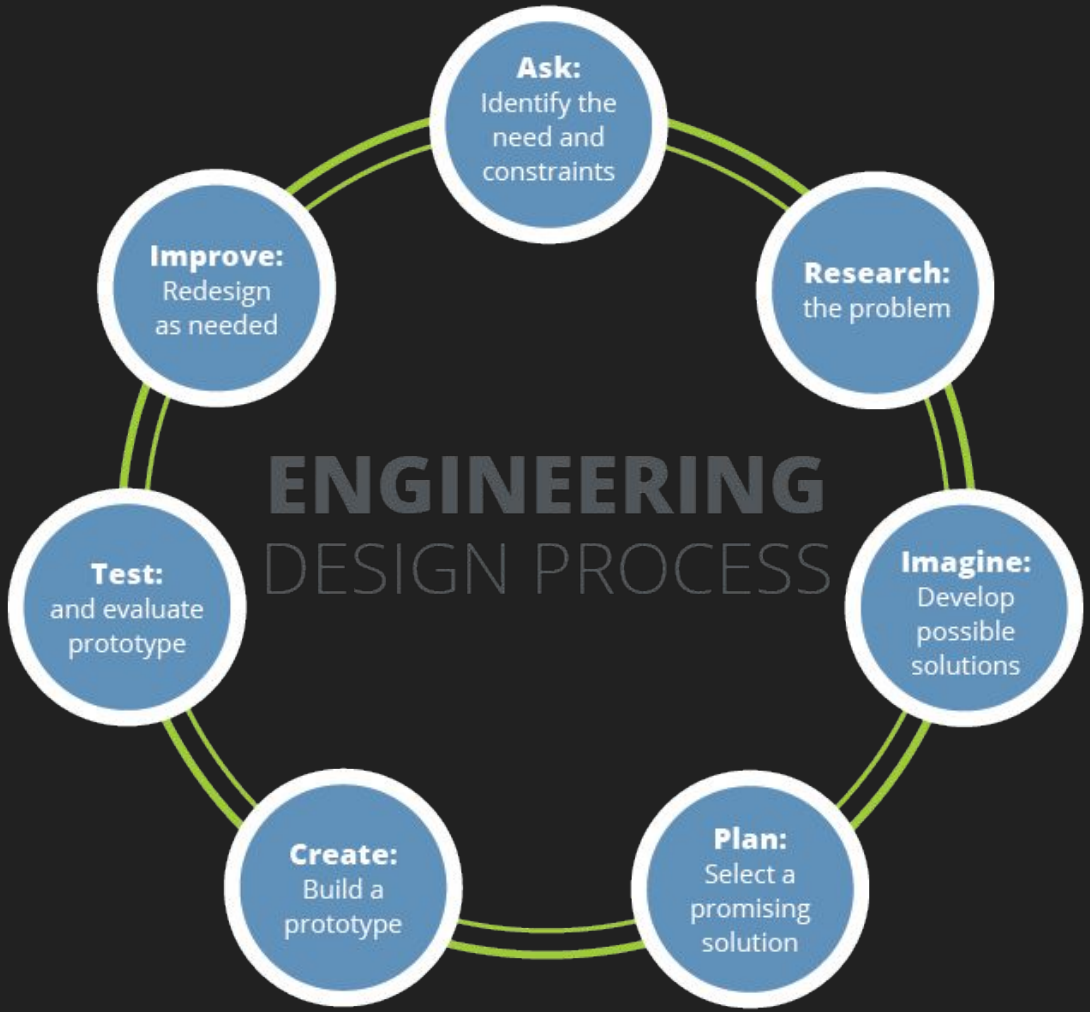
BASF
The Chemical Company
BASF
Für die Stutzenstellung ist nur der Grundriß maßgebend!
"B"

Design

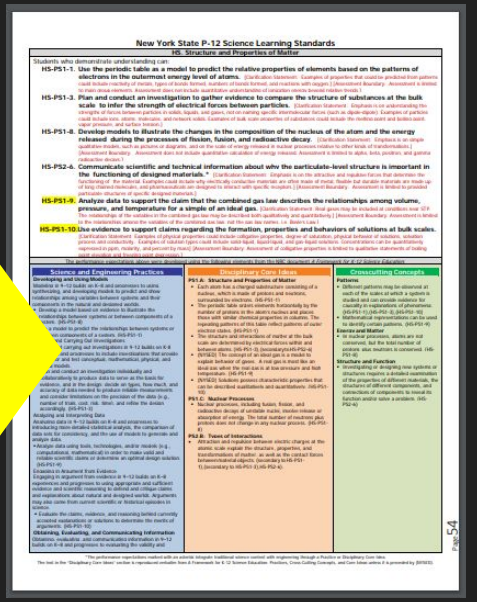
Benchmarking

Coding

Writing


Ask:
Identify the need and constraints
Research:
the problem
Imagine:
Develop possible solutions
Plan:
Select a promising solution
Create:
Build a prototype
Test:
and evaluate prototype
Improve:
Redesign as needed
ENGINEERING
DESIGN PROCESS

Science and Engineering Practices


New York State P-12 Science Learning Standards

HS. Structure and Properties of Matter

Students who demonstrate understanding can:

HS-PS1-1. **Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.** [Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.] [Assessment Boundary: Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.]

HS-PS1-3. **Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.** [Clarification Statement: Emphasis is on understanding the strengths of forces between particles in solids, liquids, and gases, not on naming specific intermolecular forces (such as dipole–dipole). Examples of particles could include ions, atoms, molecules, and network solids. Examples of bulk state properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.]

HS-PS1-8. **Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.** [Clarification Statement: Emphasis is on simple qualitative models, such as pictures or drawings, and on the scale of energy released in nuclear processes relative to other kinds of transformations.] [Assessment Boundary: Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, positron, and gamma radioactive decays.]

HS-PS2-6. **Communicate scientific and technical information about why the particulate-level structure is important in the functioning of designed materials.*** [Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chainlike molecules, and pharmaceuticals are designed to interact with specific receptors.] [Assessment Boundary: Assessment is limited to provided particulate structures of specific designed materials.]

HS-PS1-9. **Analyze data to support the claim that the combined gas law describes the relationships among volume, pressure, and temperature for a simple of an ideal gas.** [Clarification Statement: Real gases may be included at conditions near STP. The relationships of the variables in the combined gas law may be described both qualitatively and quantitatively.] [Assessment Boundary: Assessment is limited to the relationships among the variables of the combined gas law. Ad Hoc use has limits. (i.e. Boiler's Law)]

HS-PS1-10. **Use evidence to support claims regarding the formation, properties and behaviors of solutions at bulk scales.** [Clarification Statement: Examples of physical properties could include colligative properties, degree of solubution, physical behavior of solutions, solution process and conductivity. Examples of solution types could include solid-liquid, liquid-liquid, and gas-liquid solutions. Concentrations can be qualitatively expressed in ppm, molarity, and percent by mass.] [Assessment Boundary: Assessment of colligative properties is limited to qualitative statements of boiling point elevation and freezing point depression.]

The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

This text in the "Disciplinary Core Ideas" section is reproduced verbatim from A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas, where it is preceded by [EPISTE].

Page 54

1. Asking questions and defining problems
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Brainstorming is Never Unstructured!

MENU

Subscribe | Sign In | Register

Harvard Business Review

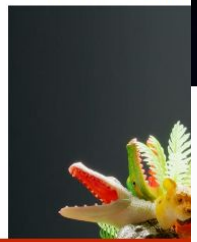
MEETINGS

Why Gr
Brainst
of Time

by Tomas Chamorro-Pre

MARCH 25, 2015

SAVE SHARE 41 COM



WHAT TO READ NEXT

Forbes

Billionaires Innovation Leadership Money Consumer Industry Lifestyle Featured BrandVoice Lists

KPMG
The Future of Audit
How will advanced technologies impact the audit?
LEARN MORE

49,316 views | Oct 8, 2014, 12:24pm

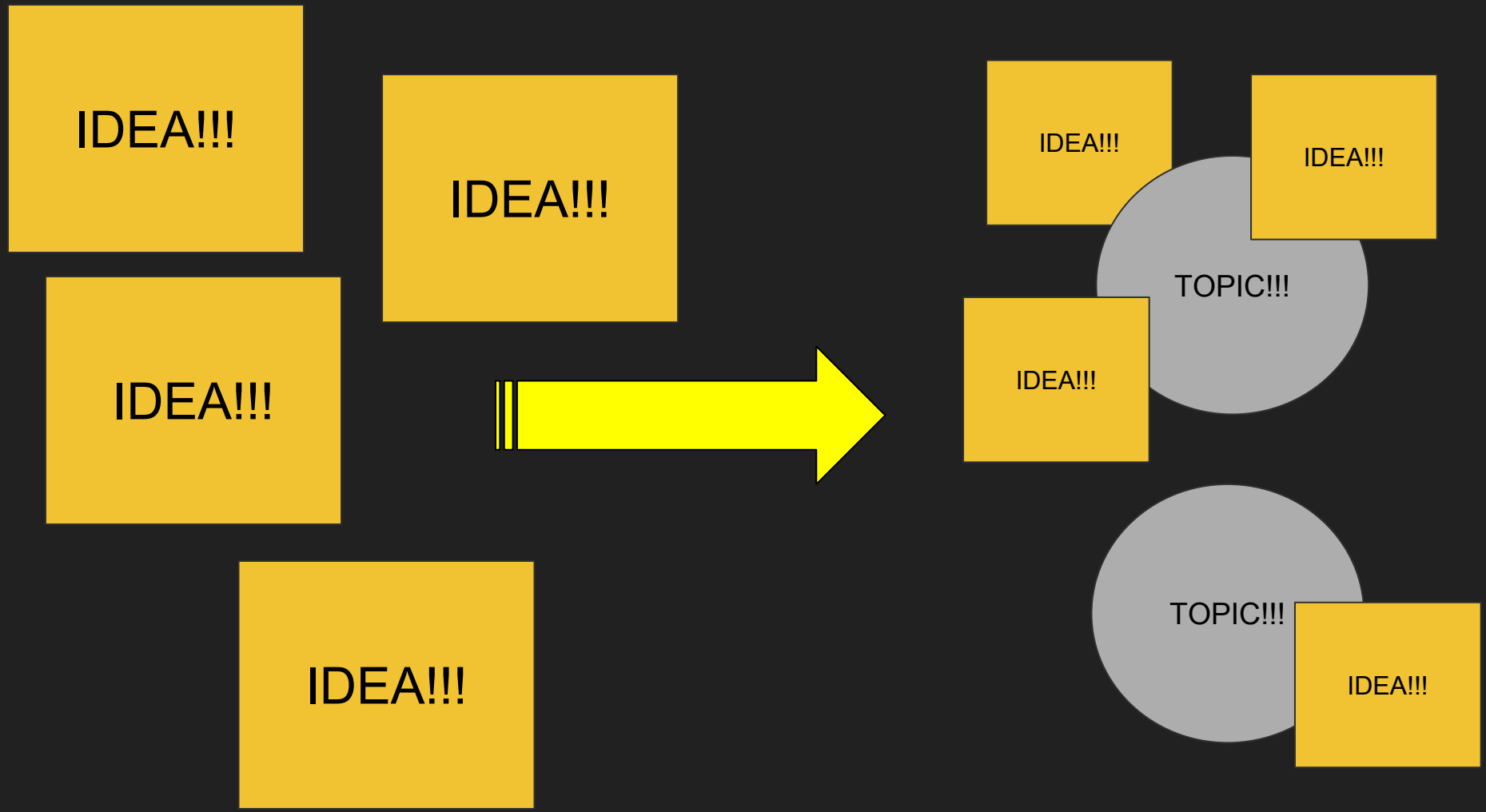
Brainstorming Doesn't Work -- Do This Instead

Rochelle Bailis Contributor

I write about business leadership, psychology and innovation.

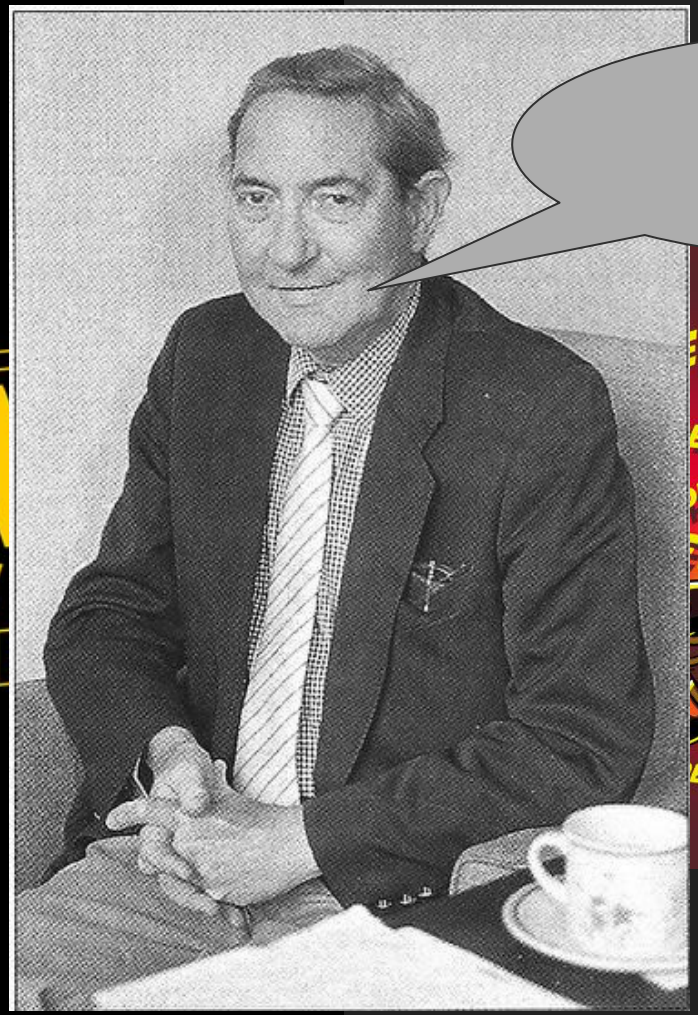
TWEET THIS

SAMSUNG Galaxy Tab S4
Upgrade


IDEA!!!
IDEA!!!
IDEA!!!
IDEA!!!
IDEA!!!
IDEA!!!
TOPIC!!!
IDEA!!!
TOPIC!!!
IDEA!!!

Requirements	Constraints

BMWBLOG
15:56:57
ENTSPERREN: NACH
OBEN SCHIEBEN



Pugh!
Pew!

Weighted Pugh Chart

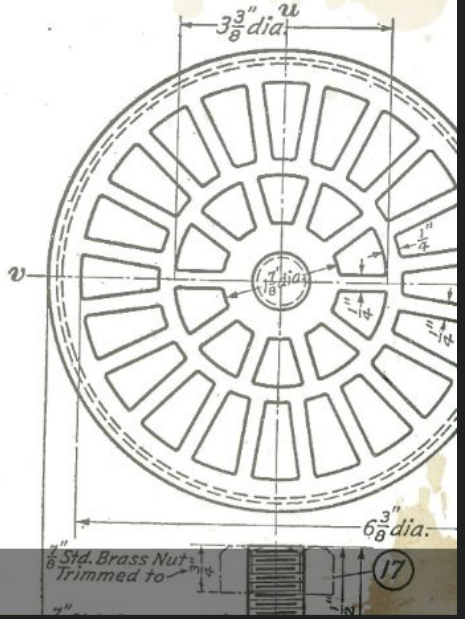
Criteria	Weight	Design 1	Design 2	Design 3
Mass	4	+	++	+
Size	2	-	-	+
Shape	0.5	0	0	++
Average		2	6	7

Fig. 25

Rationalize.io

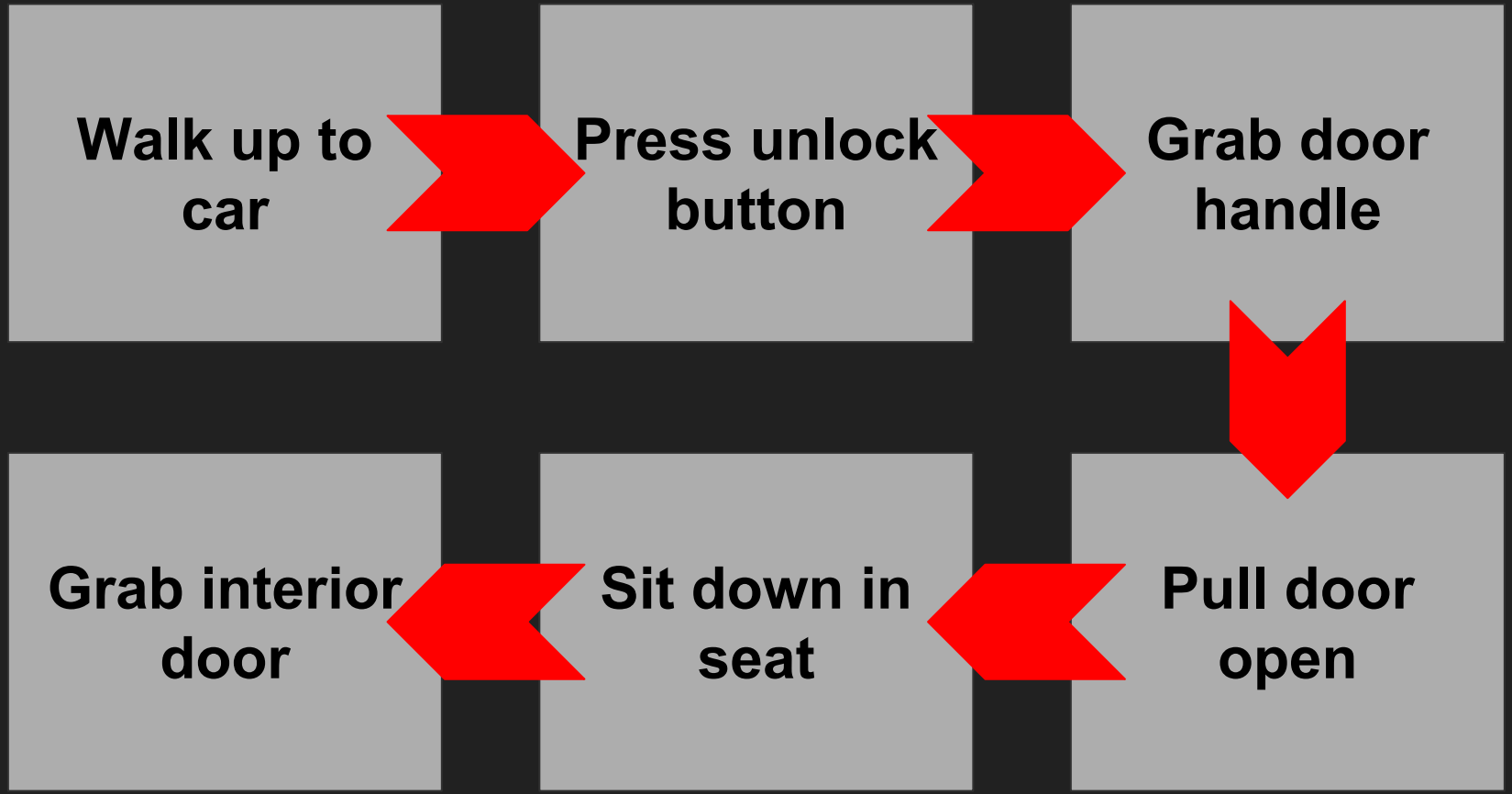
Make better decisions

Launch the App

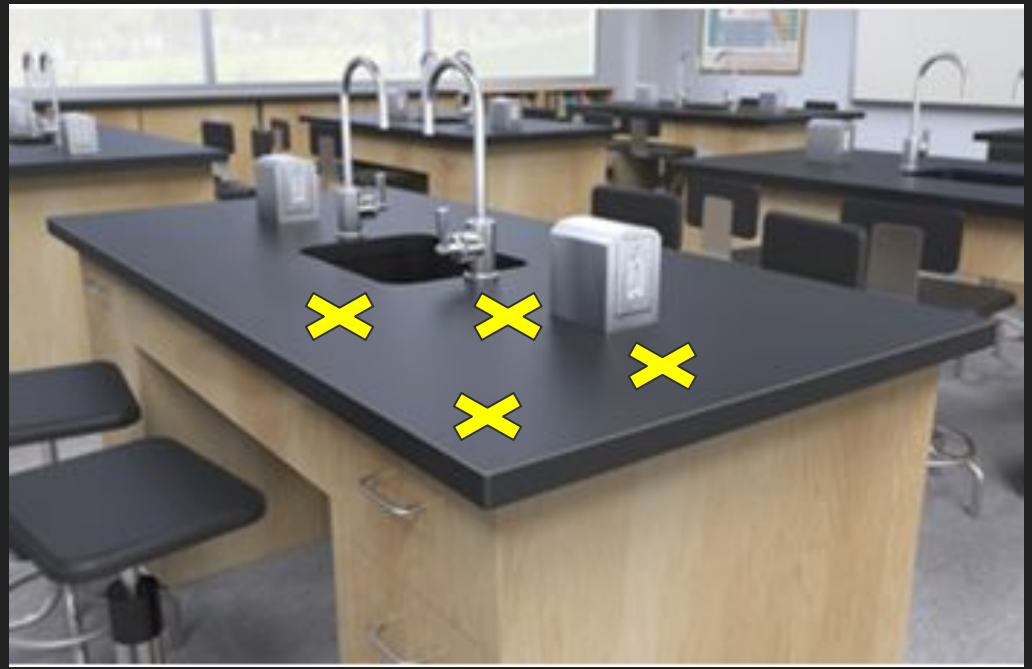


Action-Function Table

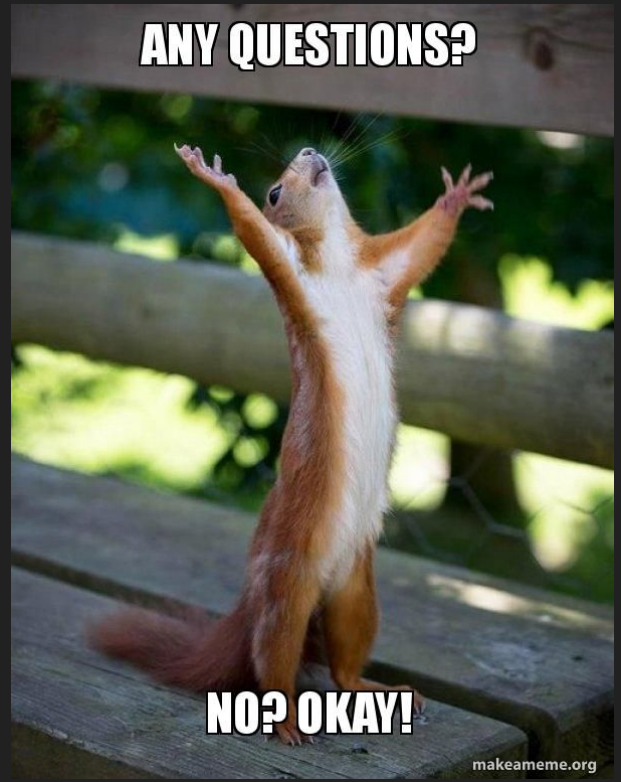
Action	Function	Notes


Walk up to car
Press unlock button
Grab door handle
Pull door open
Sit down in seat
Grab interior door

What can you measure?



Quantitative

How do you know when you're done?

Give the EDP a Test Drive!