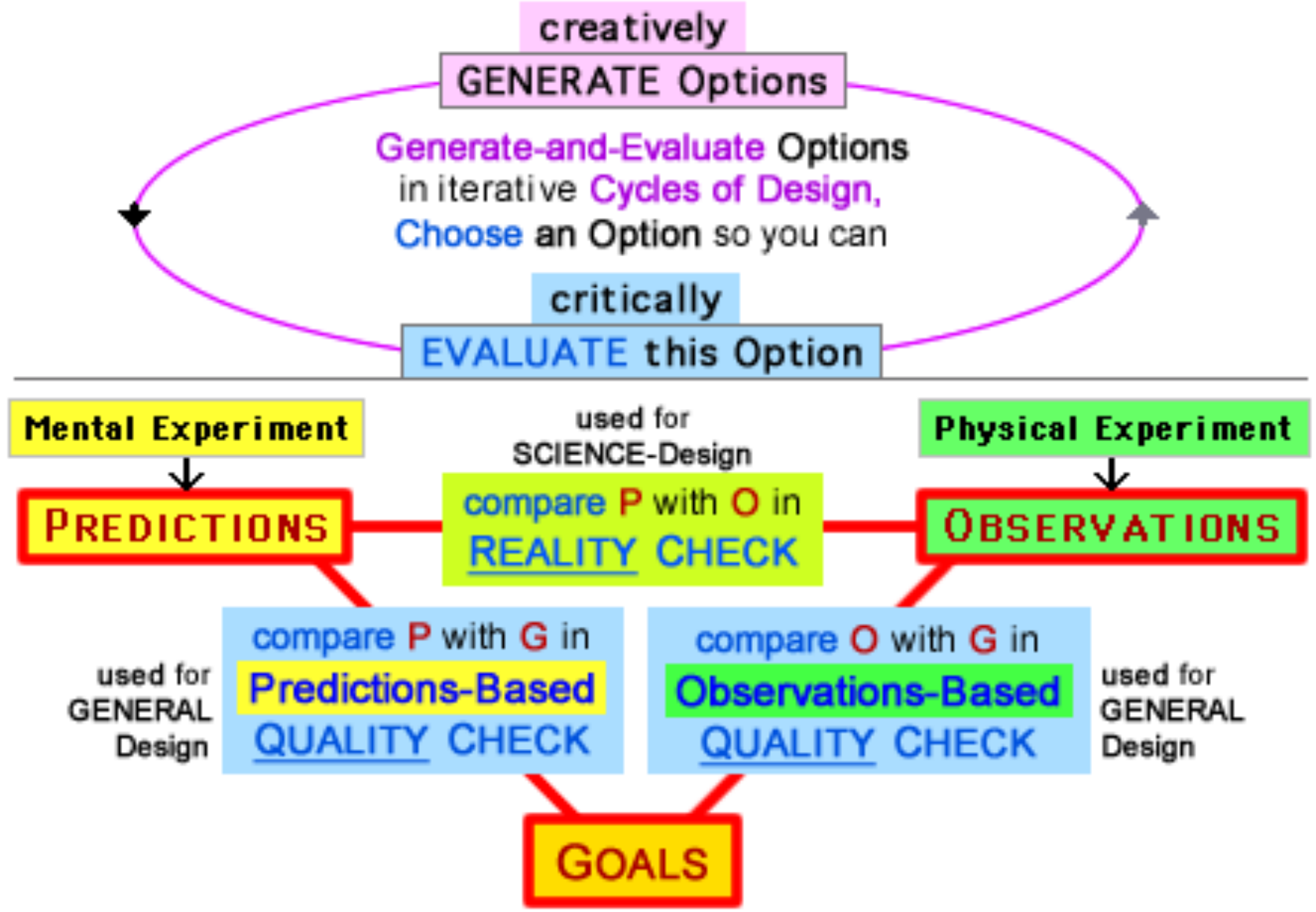
This is the central core of my model for Design Process.

Mystery Question: Why does the Cycle have an arrow on its right side, pointing from Evaluate to Generate?



Use Metacognitive Thinking Strategies to improve Learning and Problem Solving

a presentation for OAGC on October 13, 2025,
by **Craig Rusbult** – an enthusiastic educator
with a PhD in C&I from U of Wisconsin,
who wants to find co-enthusiasts.

50-word summary in conference program:

Give students educationally useful experiences, and use metacognitive thinking strategies (self-questioning, reflection, SRL, my problem-solving model,...) to help them learn more from their experiences, improve their knowledge and skills. Use the wide scope of "problem solving" to build motivational transfer-bridges (from school into life) throughout the curriculum.

a quick "big picture overview" of topic-areas in my talk:

- my model for **Design Process** (i.e. for Problem-Solving Process).
- **why** Design Process has **two wide scopes** (for **Activities & Process**);
  how these wide scopes **are educationally beneficial** by helping us
  build bridges (from school into Life) **that will motivate students;**
  why the wide scopes **promote transfers Across Areas & Thru Time.**
- **metacognition** (**what** it is, **why** it's useful, **how** Design Process can help students develop-and-use **metacognitive Thinking Strategies.**
- questions, re: Design Process from **POV**'s of **students & teachers.**

For each topic-area, my website (**Education for Problem Solving**) can help you develop a better understanding (more thorough and accurate) than you see in the quick summaries of this PowerPoint.

I'll adjust the beginning of this topic-sequence by first explaining

- why Design Process has a wide scope for Activities & Process;

followed by describing

- my model for Design Process (for Problem-Solving Process),

and then explaining

- why Design Process has a wide scope for Activities & Process;

before continuing the why-how-why of the two wide scopes, with

how these wide scopes are educationally beneficial.

Then the topic-sequence will be what you see in the previous slide.

Here are some ideas to help you use this PowerPoint:

some slides are OK to “read” (or skim) during talk, but

some slides have TMI, are useful read BEFORE or AFTER the talk.

All of the links are underlined and have GOLD TEXT.

a wide scope for Problem-Solving Activities:
broad definitions → wide scope for Activities.

PROBLEM can (and should?) be defined as...
an opportunity to **make something better.**
(better in **any way,** in **any area of life**)

PROBLEM SOLVING therefore is defined as...
whenever you do **make something better.**

Partly due to these definitions,
PS-Objectives (→ **PS-Activities**)
include **almost everything we do.**

It can be useful to think about
your **Problem-Solving Objective**
(it's **what you want to make better**)
in categories with "kinds of things" — for example, as a

product - activity - relationship - strategy

in a Problem-Solving Project for **General Design**
or a
theory
in a Problem-Solving Project for **Science-Design**

(with overlaps, often it's an **activity and relationship and**...)

what? This definition differs from a common perception that a **problem** always begins with “a bad situation” because in my definition your feelings about the current now-situation could be anywhere within a wide range:

dismal ---------- lukewarm ---------- wonderful ---- awesome

If you produce “**a move toward a better place**” anywhere in this range, whether from dismal to lukewarm, or wonderful to awesomely spectacular, this is **problem solving** because you have made the situation become better.

In the same way, I broadly define the **designing** that is **problem solving.**

why? People solve problems because we want to make things better. Or we want to avoid letting things get worse. We can “make things better” by increasing quality or maintaining quality, by promoting beneficial change or resisting harmful change.

two ways to learn: A student can learn **from their discoveries** and **from a teacher's explanations.** / My "Discovery Page" describes...

your learning by discovering: When you explore three diagrams in in my model for **Design Process** (for Problem-Solving Process), you will discover. You will understand the Problem-Solving Actions that people use when we are designing solutions for problems. These productive Actions are logically organized so you'll understand more easily, and will improve your problem-solving skills more effectively.

your process of exploring: In each diagram, observe (and think about) the words & colors and spatial relationships, always asking "what does this mean? what action is being described?"

your process of recognizing: While you're exploring the diagrams, think about the actions you use (naturally & intuitively) while you are solving problems, and you will recognize that **Your Own Actions are the Problem-Solving Actions** you see in diagrams for Design Process. In this way, your **Discovery Learning** becomes **Recognition Learning.**

Diagram 1 — Define and Solve

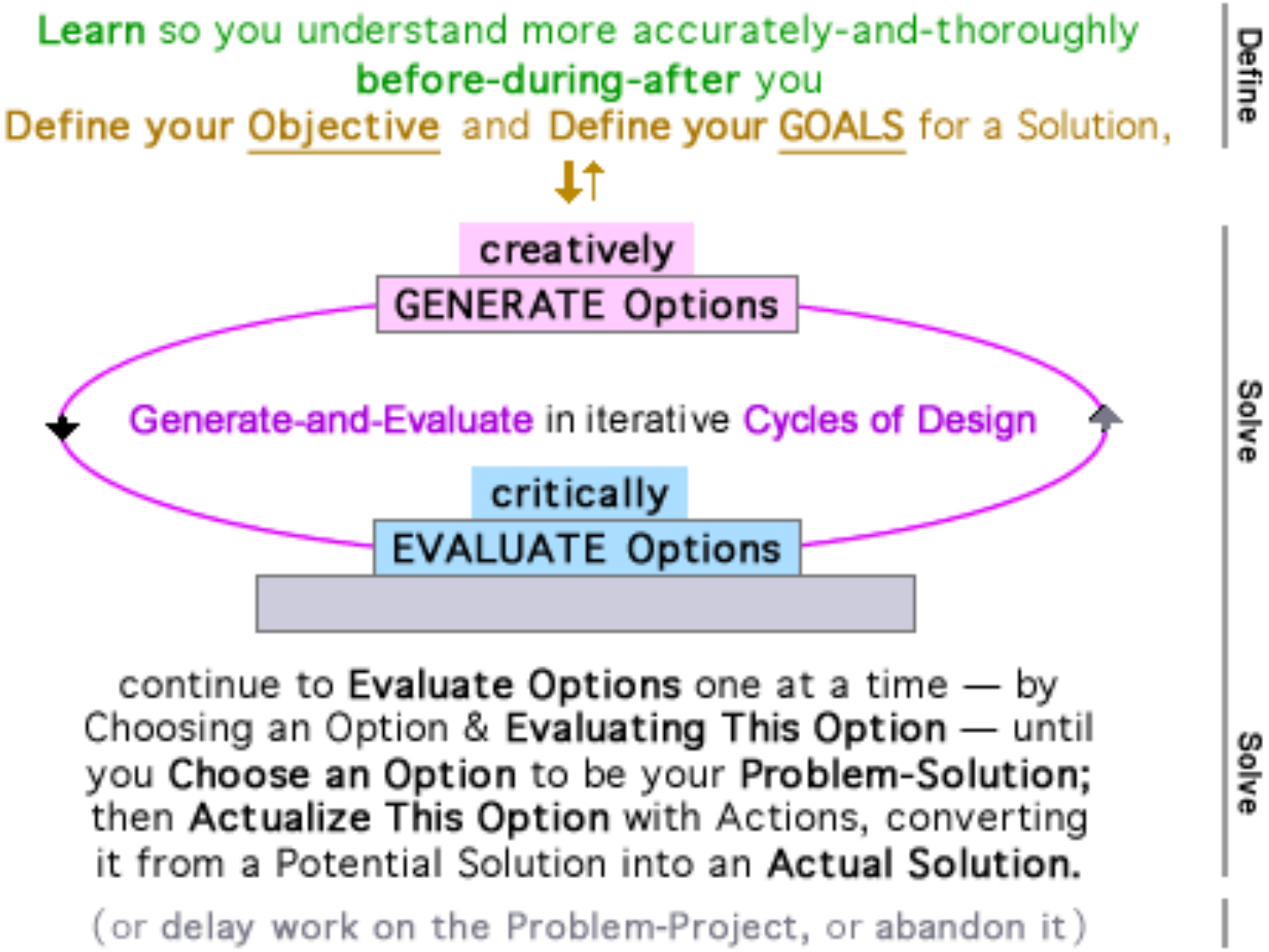
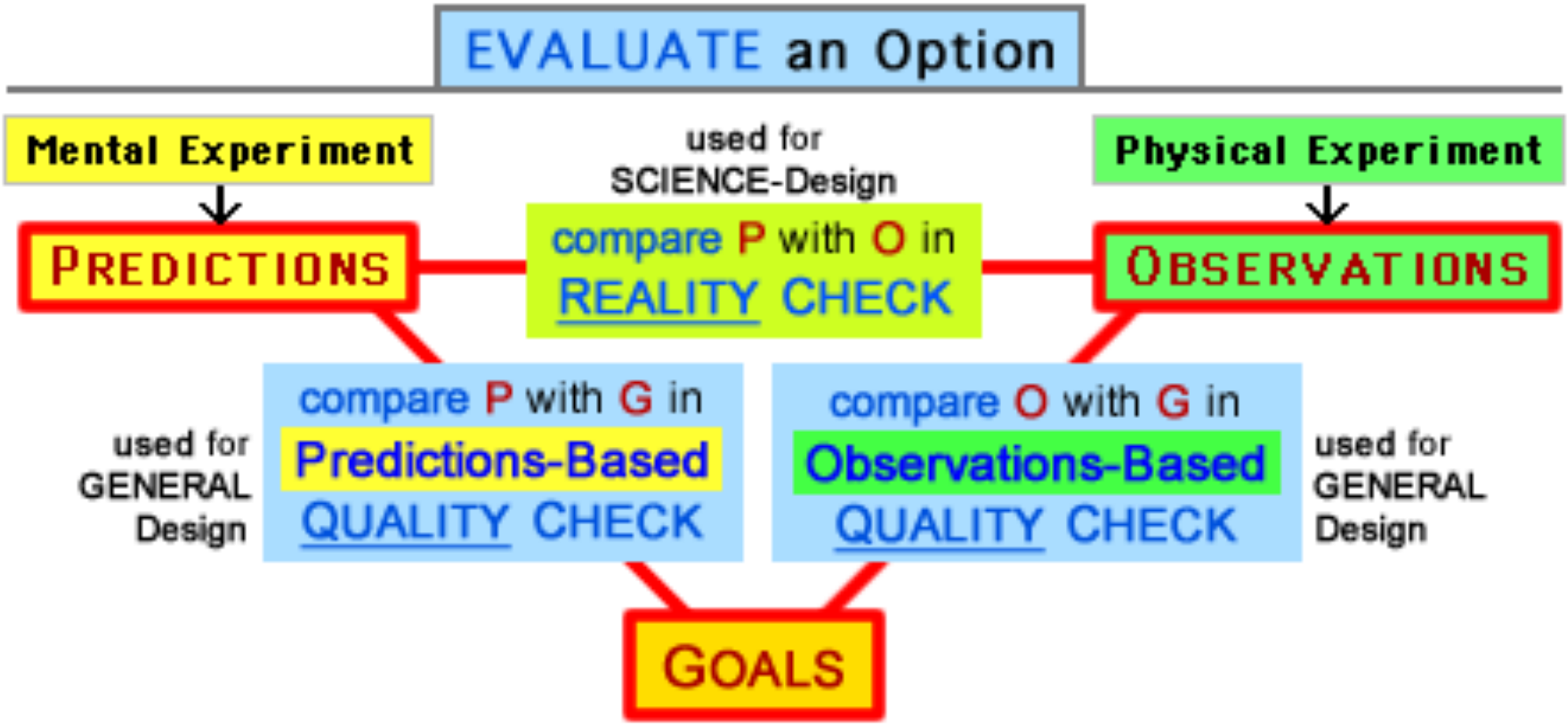
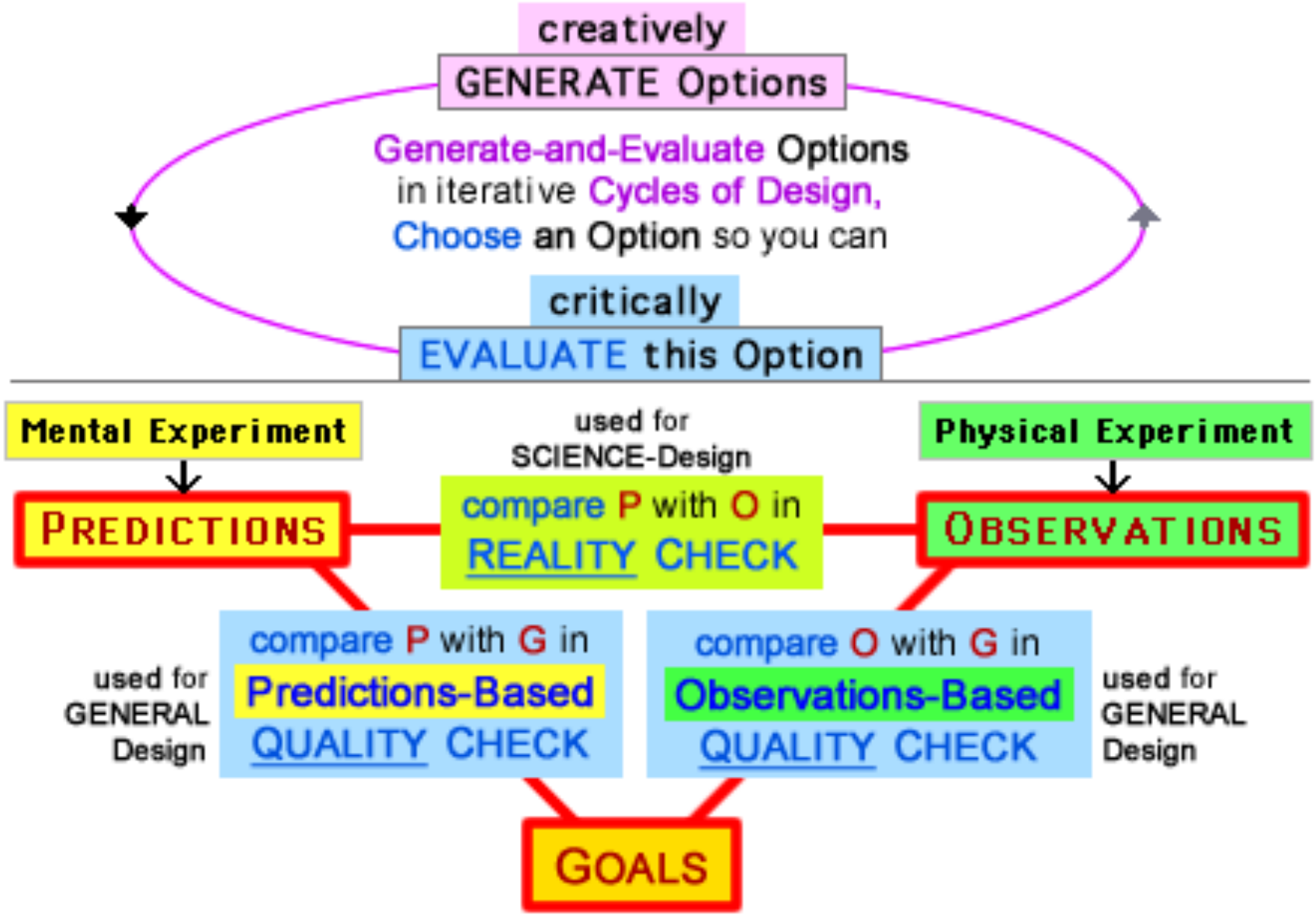
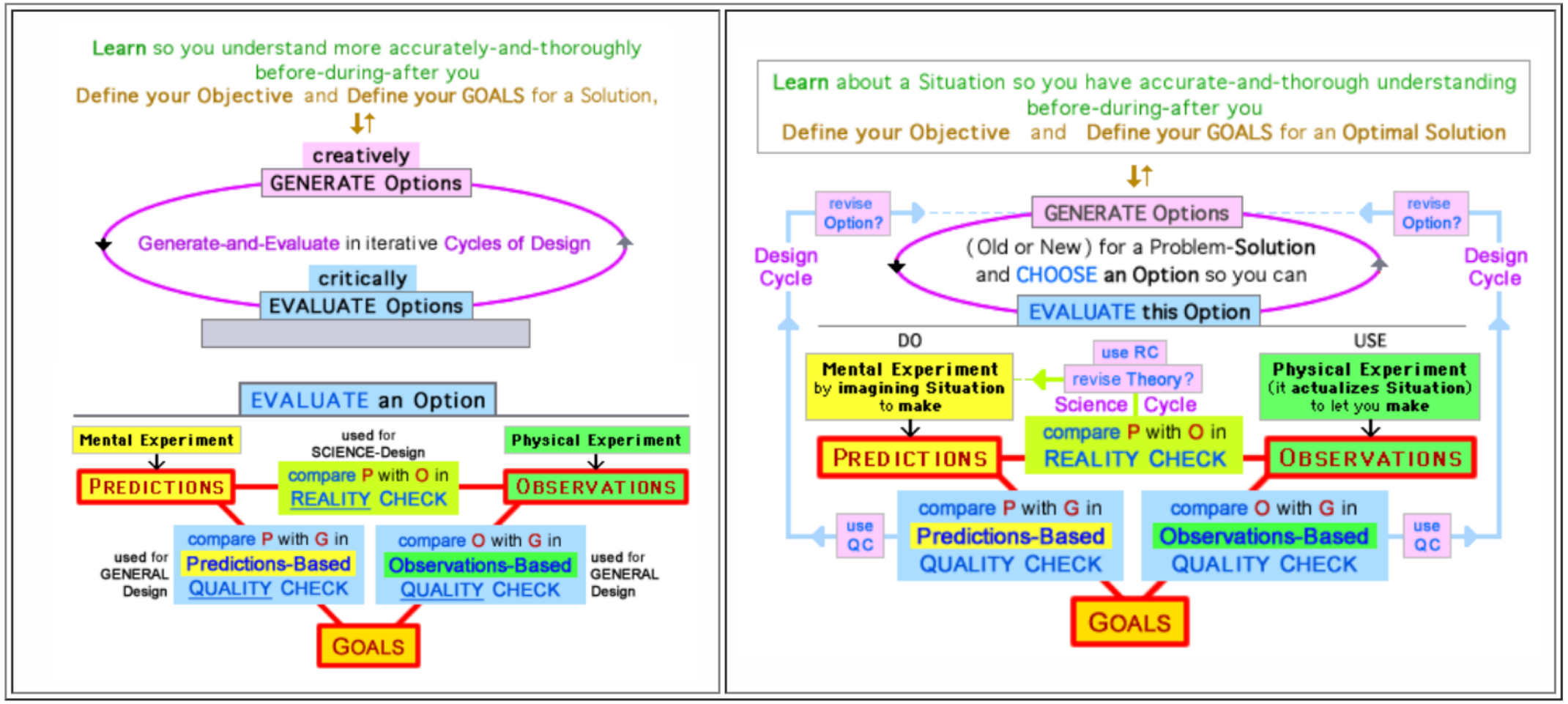


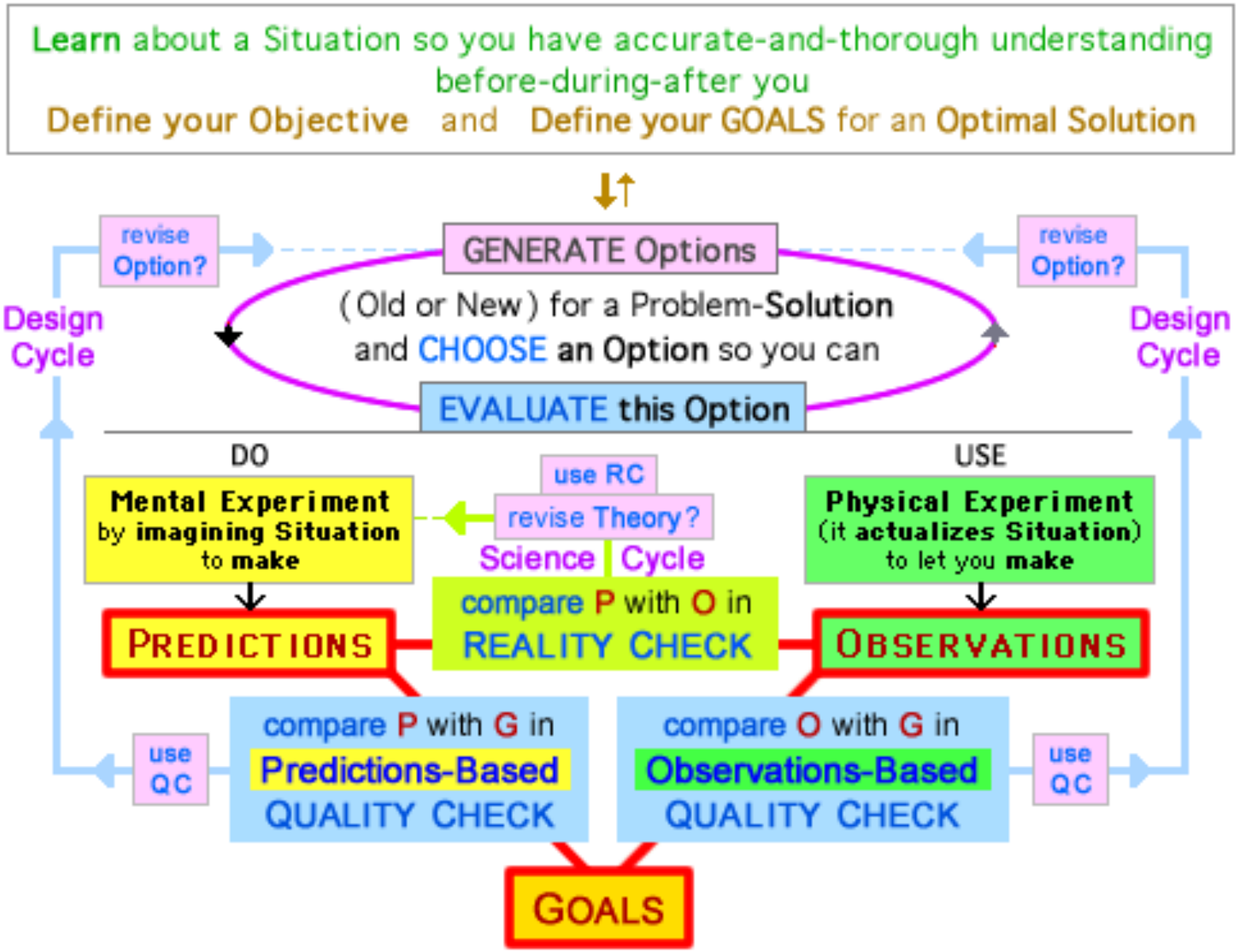
Diagram 2 — 3 Elements are used in 3 Comparisons




creatively
GENERATE Options
Generate-and-Evaluate Options
in iterative Cycles of Design,
Choose an Option so you can
critically
EVALUATE this Option
Mental Experiment
used for
SCIENCE-Design
Physical Experiment
PREDICTIONS
compare P with O in
REALITY CHECK
OBSERVATIONS
used for
GENERAL
Design
compare P with G in
Predictions-Based
QUALITY CHECK
compare O with G in
Observations-Based
QUALITY CHECK
used for
GENERAL
Design
GOALS

Above, my **new favorite diagram** (not Diagram 2) shows how "**1+2 ≈ 3**" and it might replace **the left side of this table** (made in July) that shows how **2** fills "the gray box" in **1**, and how **3** answers the **Mystery Question.**



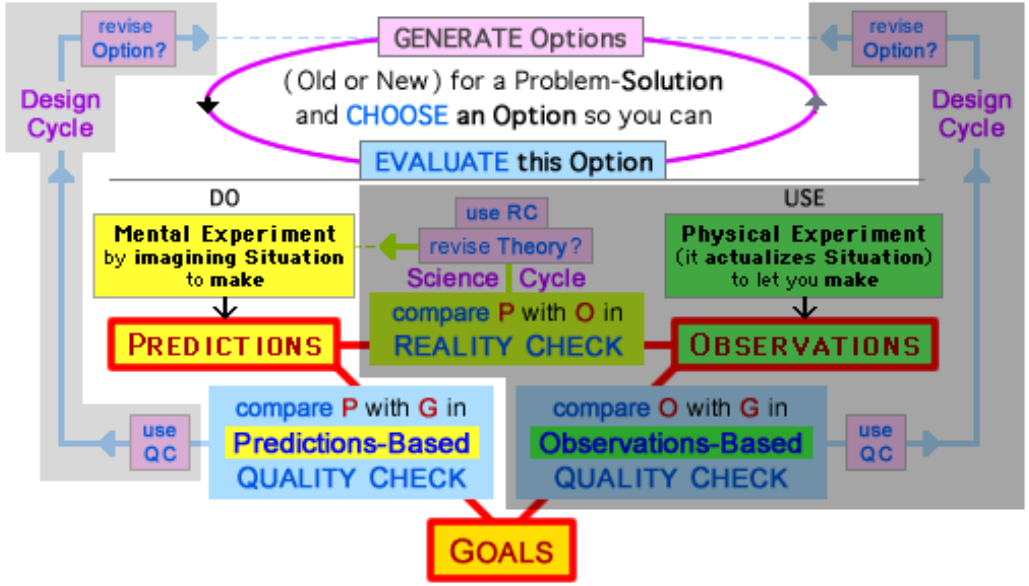

Learn about a Situation so you have accurate-and-thorough understanding before-during-after you
Define your Objective and Define your GOALS for an Optimal Solution
revise Option?
GENERATE Options
revise Option?
Design Cycle
(Old or New) for a Problem-Solution
and CHOOSE an Option so you can
Design Cycle
EVALUATE this Option
DO
USE
use RC
Mental Experiment by imagining Situation to make
revise Theory?
Physical Experiment (it actualizes Situation) to let you make
Science Cycle
compare P with O in REALITY CHECK
PREDICTIONS
OBSERVATIONS
compare P with G in Predictions-Based QUALITY CHECK
compare O with G in Observations-Based QUALITY CHECK
use QC
use QC
GOALS

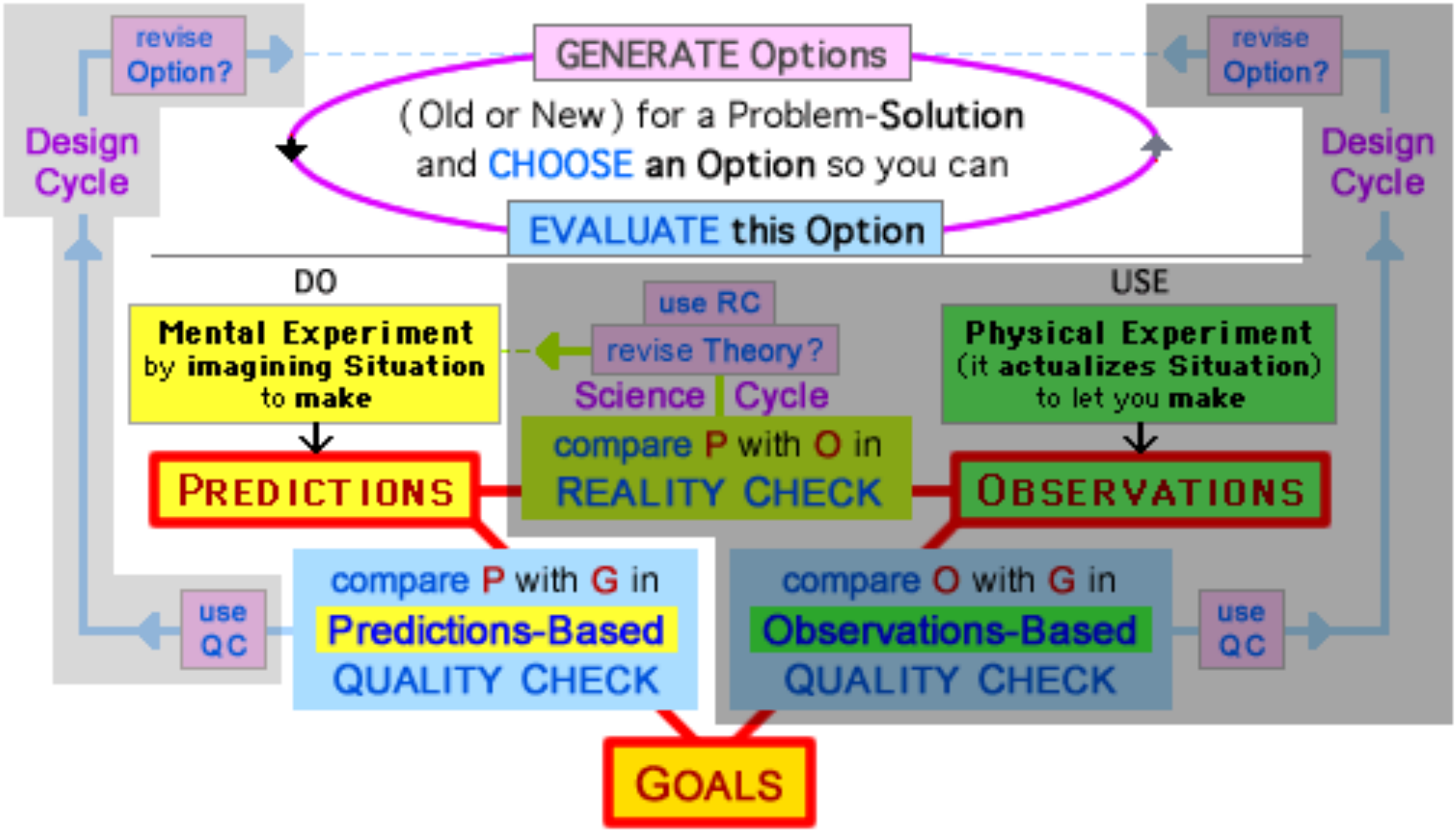
the Mystery Answer: a **Quality Check** asks **The Design Question** ("**how high is the Quality?**" with Quality defined by your GOALS) that also is asking "**how close is the match?**" when comparing This Option's **Actual Properties** (Predicted or Observed) with the **Desired Properties** that you defined by your GOALS.

a **Reality Check** asks **The Science Question** ("**how close is the match?**" when comparing **Predictions** with **Observations**); the RC-Answer is an important factor – ideally should it be the only factor**?** – in determining if your **theory** about "how the world works" (thus "what will happen") **is true** (meaning that it **corresponds with reality!**)

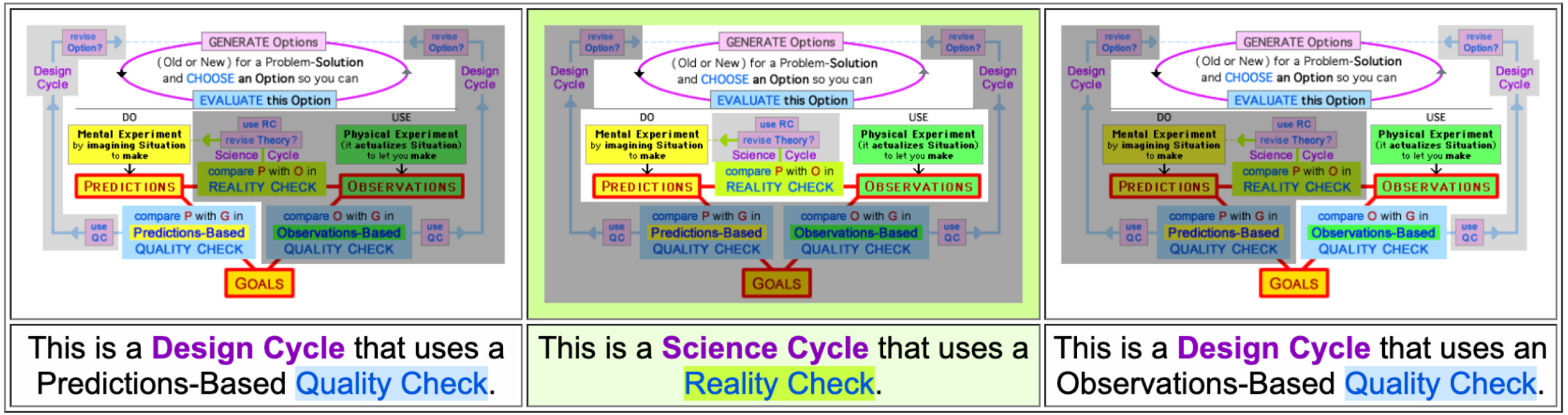
Below, in the unshaded and lightly-shaded regions you see the most common **Sequence of Problem-Solving Actions,** in the downward flow of Action-verbs — Generate, **Choose, Evaluate** (DO by imagining to make, **compare**), use, revise, Generate — that completes a Cycle of Design.

It's a common **Action-Sequence** because in each pair of Actions, one Action leads to the next Action, when you do one Action and then ask "what should I do next?" and decide "**I can make progress** (in Solving the Problem) **if I use the results of this Action** to do my next Action."




revise Option?
GENERATE Options
(Old or New) for a Problem-Solution
and CHOOSE an Option so you can
EVALUATE this Option
revise Option?
Design Cycle
Design Cycle
DO
USE
use RC
revise Theory?
Science Cycle
Mental Experiment
by imagining Situation
to make
Physical Experiment
(it actualizes Situation)
to let you make
compare P with O in
REALITY CHECK
PREDICTIONS
OBSERVATIONS
use QC
compare P with G in
Predictions-Based
QUALITY CHECK
compare O with G in
Observations-Based
QUALITY CHECK
use QC
GOALS

This **Action Sequence** (a **Predictions-Based Quality Check**) is on the left side; on the right side its an **Observations-Based Quality Check,** and in the center is a **Reality Check.**



You don't have to "learn" these three Action-Sequences (and others) because you already are using them to coordinate your PS-Process; so instead of **learning them,** you just have to **recognize them.**

an important IOU + LINKS

During the weekend of October 10-12,
this PowerPoint will continue improving
because I'll be developing-and-revising it,
with a few minor changes above
and **many major changes below.**

You can see **the current updated version**
by **clicking this link.** And an **OAGC Page**
will help you learn more time-efficiently
in my website about
Education for Problem Solving.

a reminder:

to see
the updated version
of this PowerPoint
CLICK HERE.

regarding Activities and Process, I claim that

A) our **PS-ACTIVITIES include almost all we do,**

B) our **PS-PROCESS** is **similar** for **almost all we do.**

is **similar** but is **not identical**

because **you can choose** different Action-Sequences **to metacognitively coordinate** your Design Process.

Combining these two claims → my claim that **people use a similar Process of Problem Solving** for **almost everything we do in our PS-Activities.**

HOW? using Design Process leads to wide scopes for...

A) Problem-Solving OBJECTIVES (and thus for **ACTIVITIES**)
B) Problem-Solving PROCESS.

PLUS – How People Learn: Brain, Mind, Experience, and School

How People Learn (**from National Research Council**) says **transfer** is "the ultimate goal of learning" so it's "a major goal of schooling," and recommend (based on **research about learning**) that **to increase transfer, we should:**

A) teach knowledge in multiple contexts;
this is allowed by the wide scope of **PS-Objectives;**

B) teach knowledge in a form that's easy to generalize;
Design Process does this by using a **similar PS-Process** throughout the wide range of PS-Objectives.

a summary of the previous slide:

How People Learn
says that – to increase transfers – we should
"teach knowledge in a form that's easy to generalize"
and
"easy to generalize" does occur with my model
for Design PROCESS,
for Problem-Solving PROCESS.

Why should you accept my bold claims?

Is there "**PROOF** beyond a reasonable doubt"? – **NO.**
Are there **logical REASONS** for "**a good way to bet**"? – **YES.**

We have **logical reasons** to predict that **using Design Process** is **a good way to bet,** can be **useful in educational projects, is worth developing** with investments of time, money,...

Personal Education: Area-Transfers & Time-Transfers:

When students decide that they want to pursue their own **Personal Education,** they're motivated by imagining **TRANSFERS Across Areas** (from **School** into **Life**) and **TRANSFERS Through Time** (from **Present** into **Future**).

There are logical reasons (e.g. earlier I described the **A**-and-**B** of **ACTIVITIES**-and-**PROCESS** with wide scopes) to expect **transfers Across Areas.**

By contrast, expecting **"transfers" Thru Time** depends more on the **thinking** of a student: Are they **imagining** the ways that **their present School-Learning** will improve the quality of **their future Life-Living?**

Performing Objective = want **best performing NOW.**
Learning Objective = want **best learning NOW**
so you can improve **best performing LATER.**

Past	PRESENT	Future
	Learning NOW →	Performing LATER

examples for basketball team: you have
LEARNING Objective in early-season practice,
PERFORMING Objective in late-season tournament game.

Student **expectations:** When students **think** they will get

TRANSFERS of Knowledge-and-Skills

ACROSS AREAS and **THROUGH TIME**,

this can produce TRANSITIONS in Attitudes:

Past **PRESENT** → **FUTURE**

SCHOOL → **my LIFE**

↓

MOTIVATIONS:

If I improve PRESENT PS-Skills in SCHOOL,
these will be FUTURE PS-Skills in LIFE.

And student expectations for Transfers produce another Transition in ATTITUDE,

Past LIFE → **PRESENT SCHOOL** → **Future**

↓

CONFIDENCE

I've done PS-Process BEFORE in LIFE,
so I can do it NOW in SCHOOL.

iou:

The remaining slides will be revised between now and Monday.

Maya Angelou describes Performing and Learning:

"**Do the best you can until you know better.**
Then when you know better, do better."

Or, with [my comments],

Do the best you can [with high Present Performing]
until you know better.
Then [later] **when you know better** [due to Present Learning]**,**
do better [with high Future Performing]**.**

Using an **Objective-to-Perform** usually is best short-term, but long-term it's best to ALSO sometimes use an **Objective-to-Learn.**

HOW can Educational Bridges increase Transfers Across Areas?

A) By using **broad definitions** for **Problems** & **Problem Solving,** Problem-Solving **OBJECTIVES** include almost everything we do.

And in a second wide scope,

B) my model for **Design Process** shows how we use a similar Problem-Solving **PROCESS** for almost everything we do.

Terms: In my model,
Problem-Solving Process
is **Design Process**

Personal Education is Problem-Solving Education:

We can ask students to…

think about their goals for life (involving themselves + others)* and **develop a proactive problem-solving approach** for their education, asking "how can I **solve a problem** – by **making my education better** to **make my life better** – to help me achieve my **goals for life**?"

(* and help others have better lives, with win-win goals & results?)

Personal Education is **proactive problem solving.**
A student tries to **make things better**
because they believe that…
improving **School-Life** improves **their Whole Life**
because **better Education** produces a **better Life;**
making **Their Education** better will make **Their Life** better.

Why should you accept these claims?

A) A wide scope for Problem-Solving **OBJECTIVES** is easy to show — IF you think **my broad definitions** are reasonable — and the wide scope of PS-**Objectives** lets us design PS-**Activities** that are **FUN** and (as **perceived by students**) are **USEFUL.**

B) **Later** I'll show how my model for **Design Process** – for the Problem-Solving **PROCESS** that people use for most things we do in life — is an accurate description of how we actually use **creative-and-critical thinking** while we solve problems. **If students believe** that PS-Process (used by them in **School**) will be **Personally Useful** (in **Life**), they will be motivated to invest in their own **Personal Education.**

I want to work cooperatively with other educators
to develop our ideas for improving education,
by creatively-and-synergistically combining
MY experiences-understandings-skills
with
YOUR experiences-understandings-skills.

This talk will be mainly about education for K-12,
but most ideas also can be used for college education.

If you find my ideas interesting — even if (maybe especially if)
you're thinking "**yes, but...**" because you **agree partially** (yes)
but **not totally** — of course that's ok, and it could help both
of us learn if we discuss your reasons for **yes** and also for **but**.

Originally, this slide said…

All of the remaining slides WERE about
principles and strategies you already know
(and during the weekend many will disappear)
or
they're ideas that aren't yet developed-and-revised
into a form that I later will use in the PowerPoint,
so you probably will want to stop reading here.

But I didn't want viewers to feel overwhelmed
by a huge number of slides, so I moved them
into a new file for OAGC Cuts.