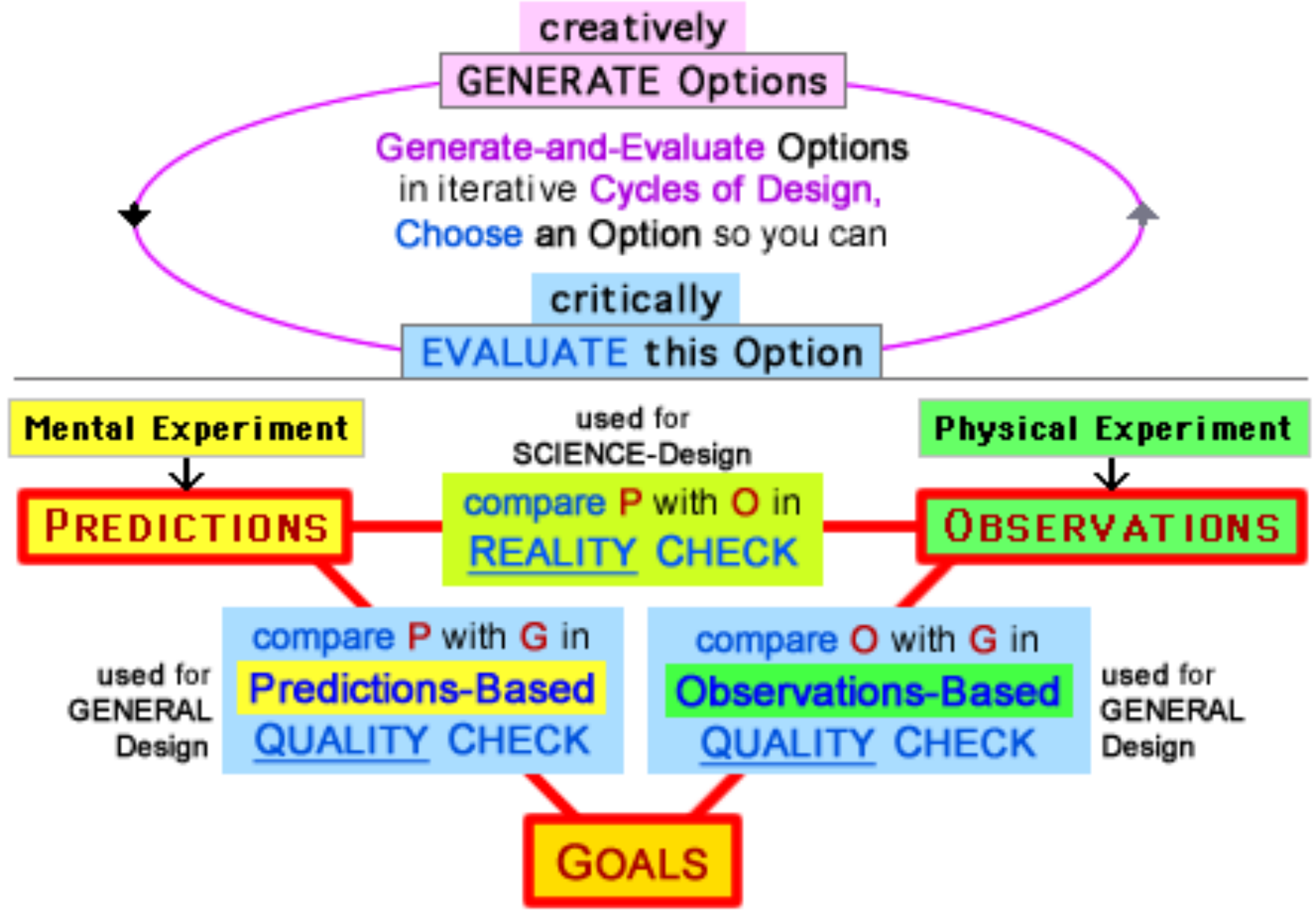
This is the central core of my model for Design Process.

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



Use Metacognitive Thinking Strategies to improve Problem Solving and Learning

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.

summary of 50 words (plus a few more) in conference program:

Give students more experiences that are educationally useful, **and use metacognitive thinking strategies** (self-questionings, reflections, 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).
- **metacognition** (**what** it is, **why** it's useful, **how** Design Process can help students develop-and-use **metacognitive Thinking Strategies.**
- **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.**
- **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.

The PowerPoint ends with useful information about the final topic:

During the talk,
I'll explain ideas and
we'll discuss POV-questions:
When we **compare the perspectives of students and teachers,**
regarding my claims about reasons for "expecting gifted students
to be **excited** about using metacognition (generally) and (specifically)
to be **fascinated** with the logic-and-art in my model for problem solving,"

Do you think students will be excited-and-fascinated?

How will teachers respond to the educational possibilities?

When we compare students and teachers, re: the claims,
Could students be “more motivated” to use metacognition?

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** (it's Problem-Solving Process),

plus the valuable strategy-skill of

- **metacognition** — what it is, how it's effective, ways to use it,

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

- **why** Design Process has **a wide scope for** ~~Activities~~ & **Process;**
- **how** the wide scopes are educationally beneficial,
- **why**...

Then the topic-sequence will be **the same as in the previous slide.**

Below, **the tips will help you effectively use this PowerPoint:**

some slides are OK to "read" (or skim) **DURING the talk,** but
some — especially those with a GRAY BACKGROUND — have TMI,
so read these "notes for myself" BEFORE or AFTER the talk, and
during the talk I will explain the main ideas in these TMI-Slides.

a BLANK SLIDE shows a transition to a New Topic.

The links are underlined and they **have GOLD TEXT .**
Most of the links go to "**more information**" **about a topic ;**
e.g. an "**OAGC Page**" describes how you can time-efficiently
use my website about **Education for Problem Solving.**

Also look at the PowerPoint later. Why?
It will continue to improve during the weekend,
because (iou) I'll develop-and-revise it thru October 12.
e.g. **Today, Oct 12,** in some parts of the PowerPoint I'm quickly
"**dumping ideas into some slides**" (those with **GRAY BACKGROUND**).
After my talk, I'll condense-and-polish these rough-draft slides.

Craig Rusbult – craigru57@yahoo.com

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.**

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.

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, it can be **activity and relationship and strategy**)

our **Problem-Solving Activities** **include almost everything we do**
mainly due to **the wide scope of STRATEGIES** (thus the **capitalizing**)
and often **STRATEGIES → DECISIONS** (or they **are DECISIONS**).

Our **most common decision** is
the result of **asking Lakein's Question,**
"**What is the best use of my time right now?**" to
Design Your Everyday-Experiences
and **in some cases** (**rare)** to
Design Your Major LIFE-Experiences
and in this way you
Design Your LIFE.

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 of Design Process** (seen in its diagrams). In this way, your **Discovery Learning** becomes **Recognition Learning.**

Diagram 1 — Define and Solve

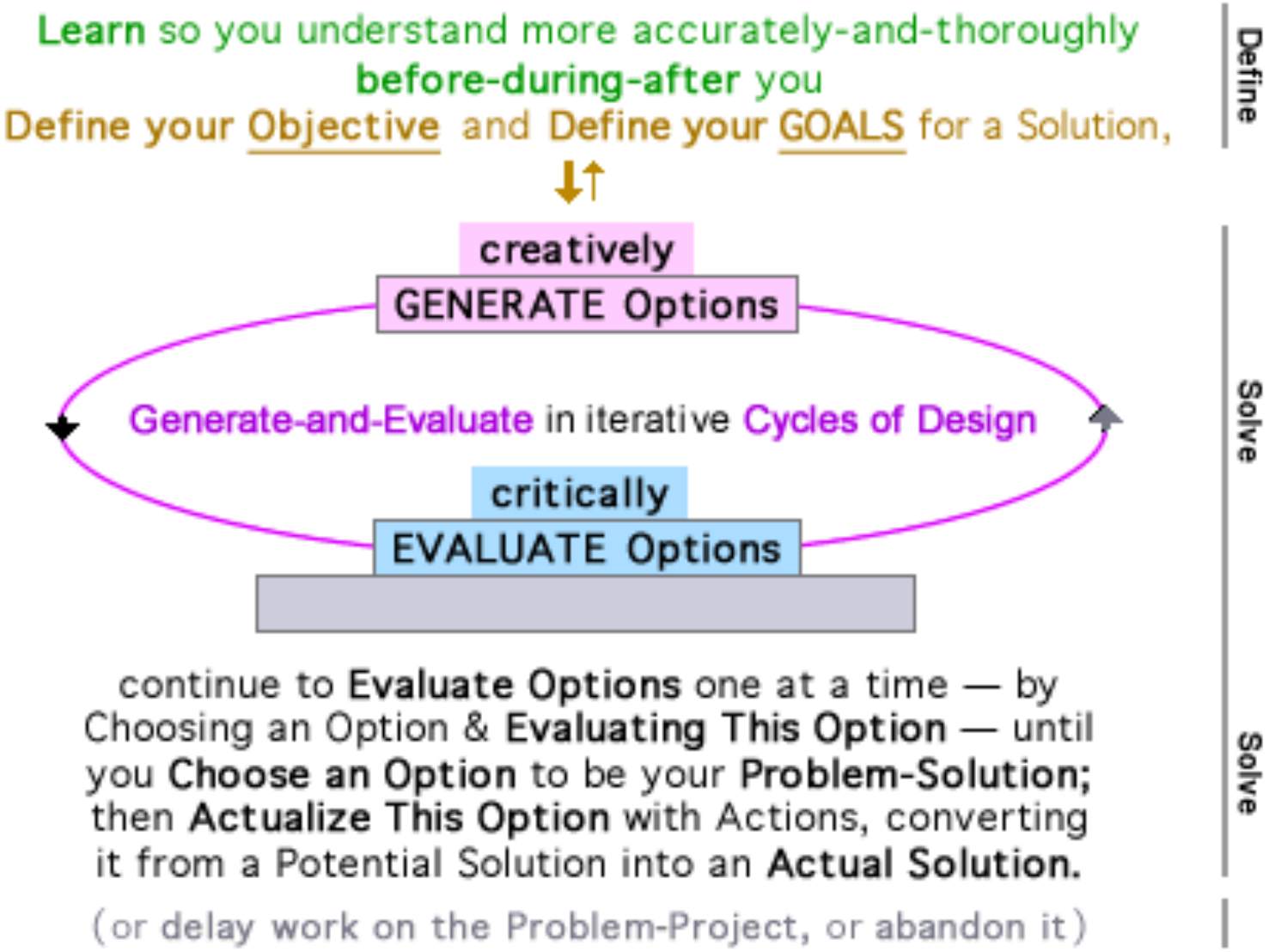
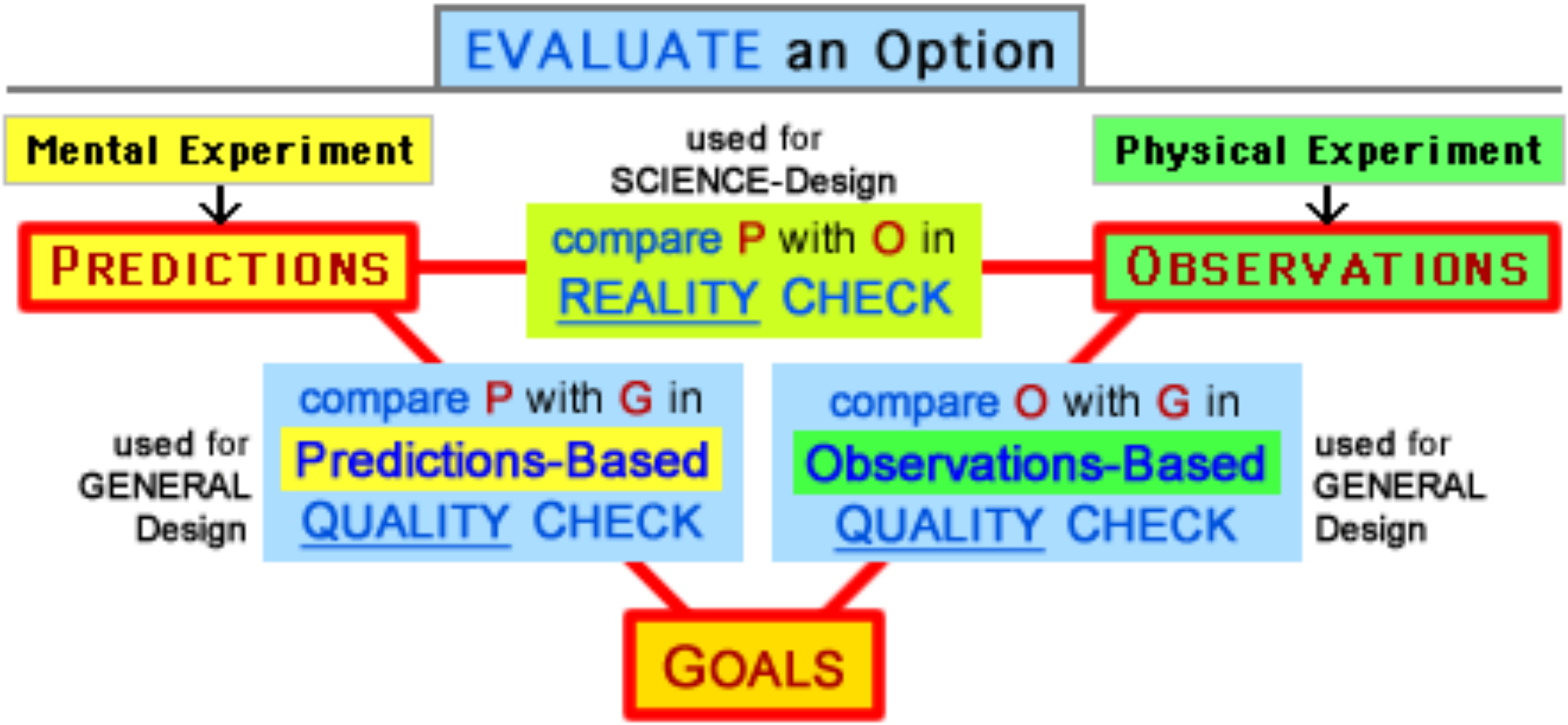
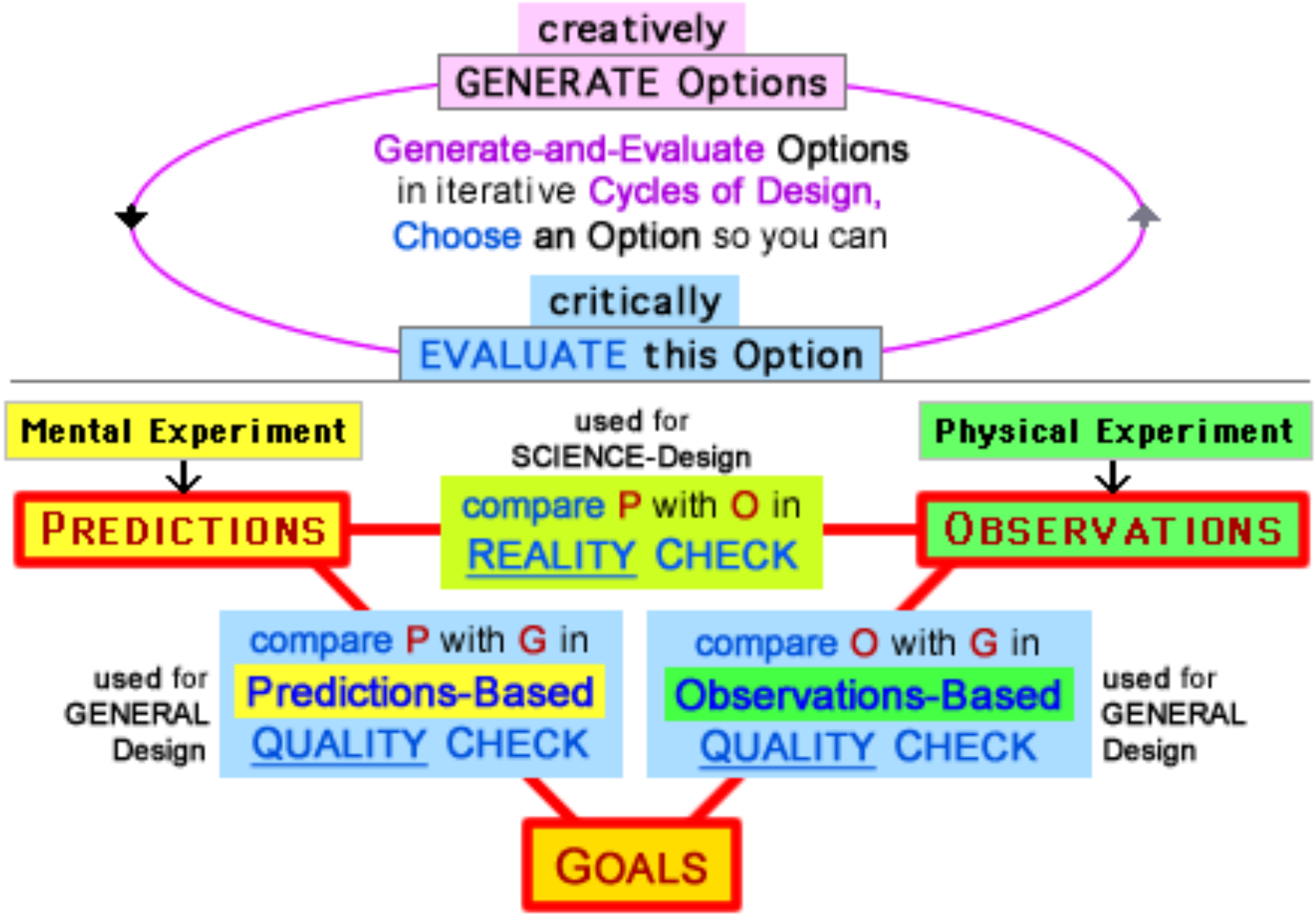
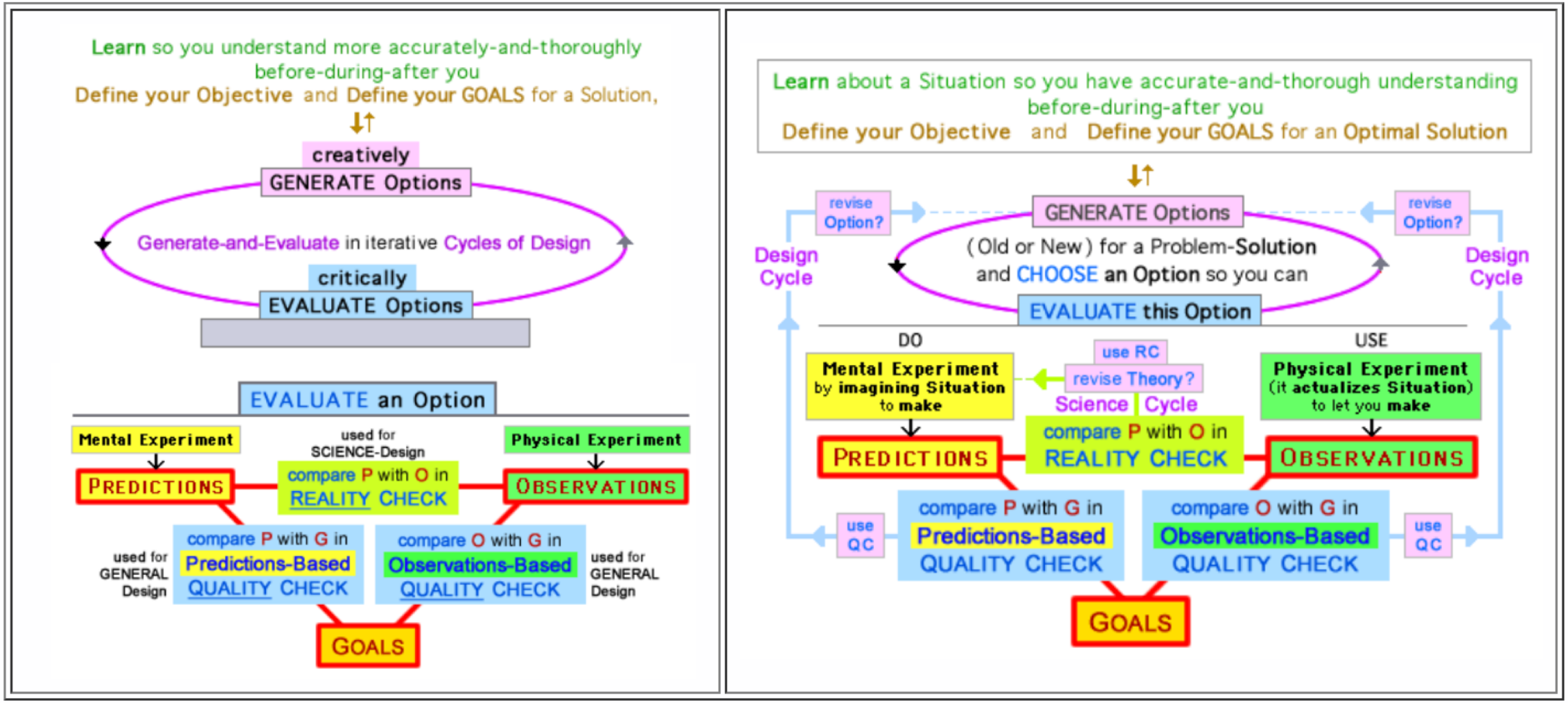


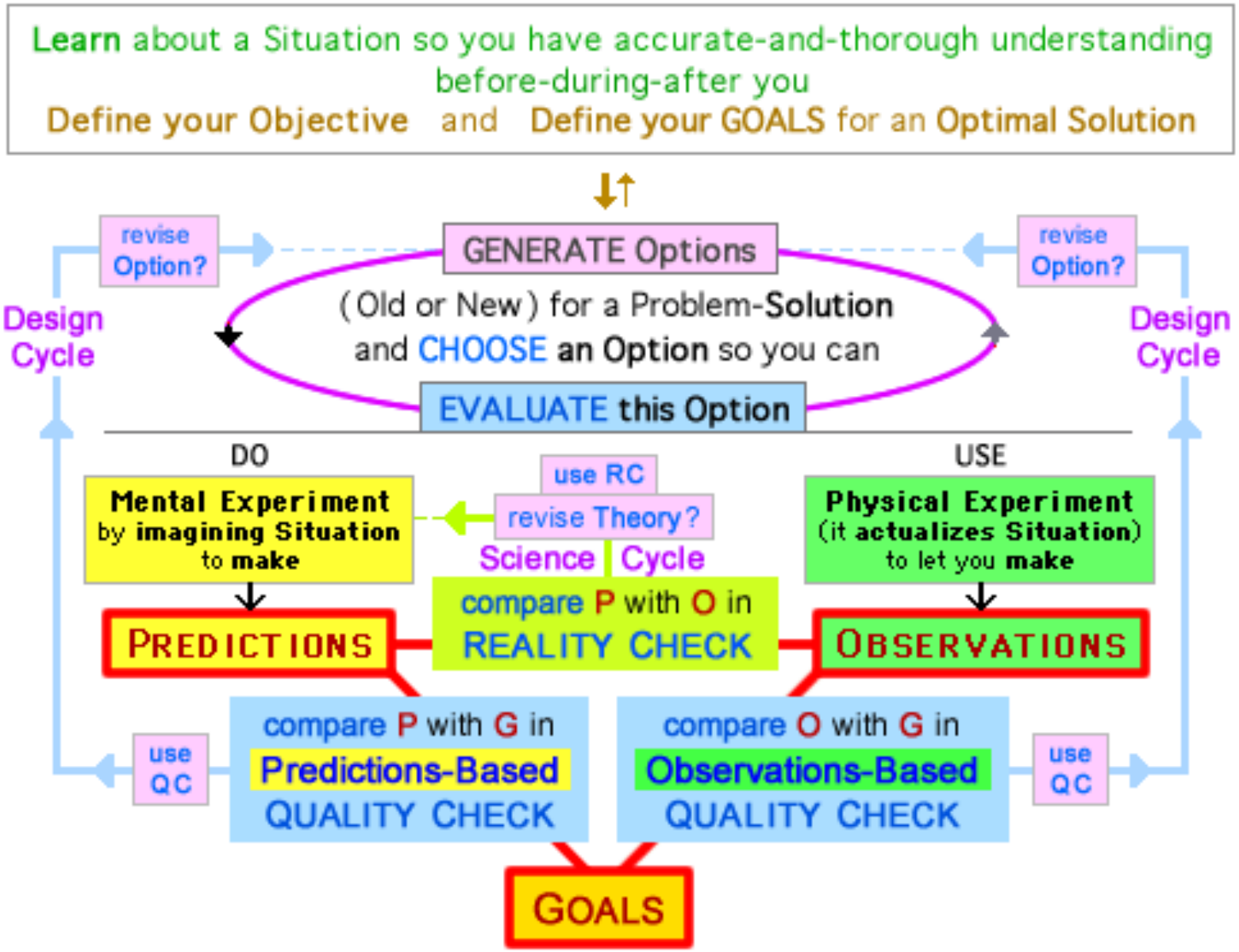
Diagram 2 — 3 Elements are used in 3 Comparisons




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

The right side of this "1+2 ≈ 3" table shows how Diagram 3 answers the Mystery Question.



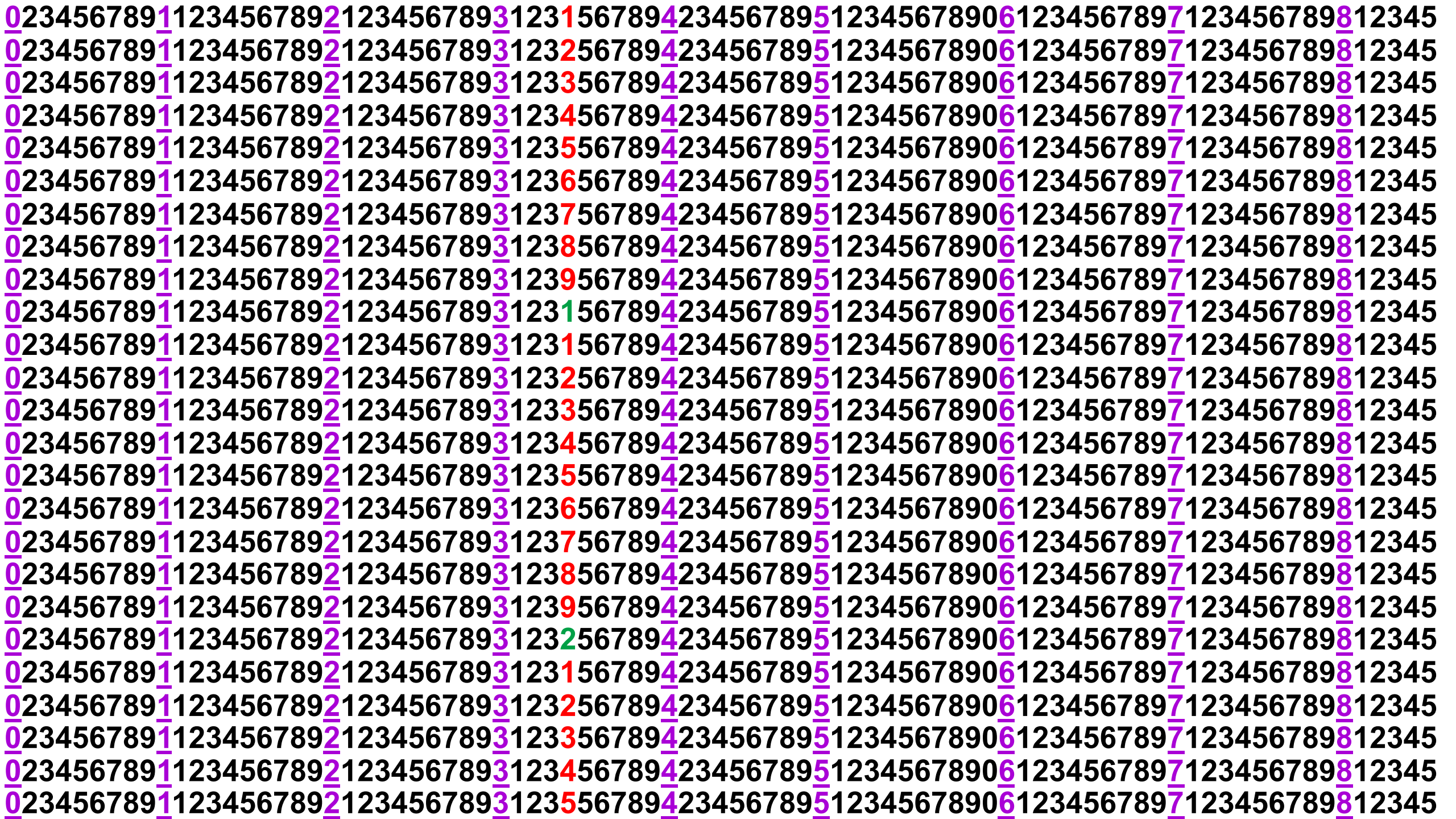

Learn about a Situation so you have accurate-and-thorough understanding before-during-after you
Define your Objective and Define your GOALS for an Optimal Solution
revise Option?
GENERATE Options
revise Option?
Design Cycle
(Old or New) for a Problem-Solution
and CHOOSE an Option so you can
Design Cycle
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!**)

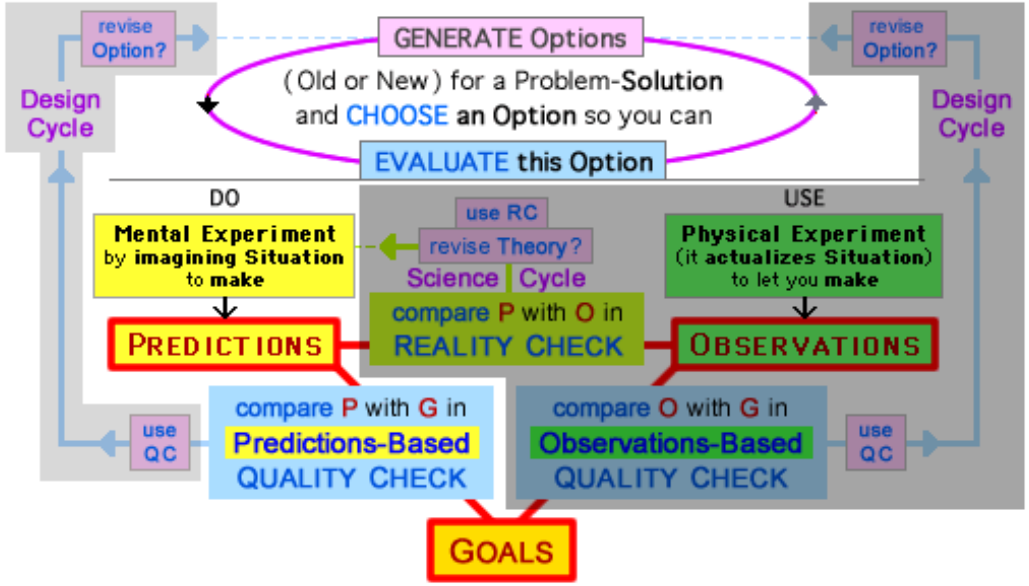
my **broad definition of Experiment:**
an **Experiment** is **any opportunity to**
make Predictions (in **Mental Experiment**) or
make Observations (in **Physical Experiment**).
{ one example is the next slide }

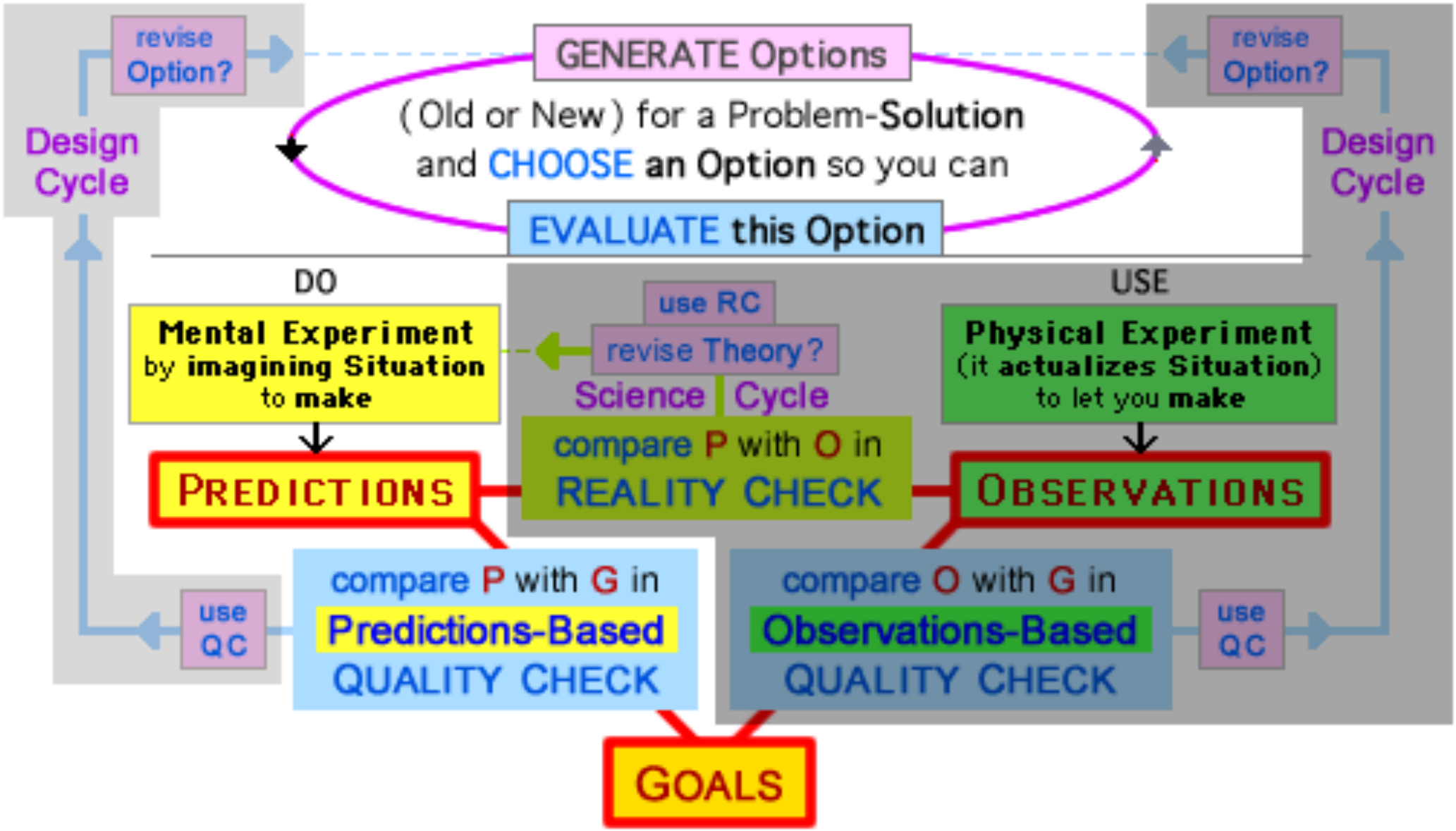
Experiments → Experiences,
so **a student can**
Design their Life-Experiences
by choosing Experiments to
Design their Life.
(ask "**what do I want?**" → **Define GOALS-for-LIFE**,
ask "**how can I effectively achieve my LIFE-GOALS?**")


0234567891123456789212345678931231567894234567895123456789061234567897123456789812345

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?
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DO
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use RC
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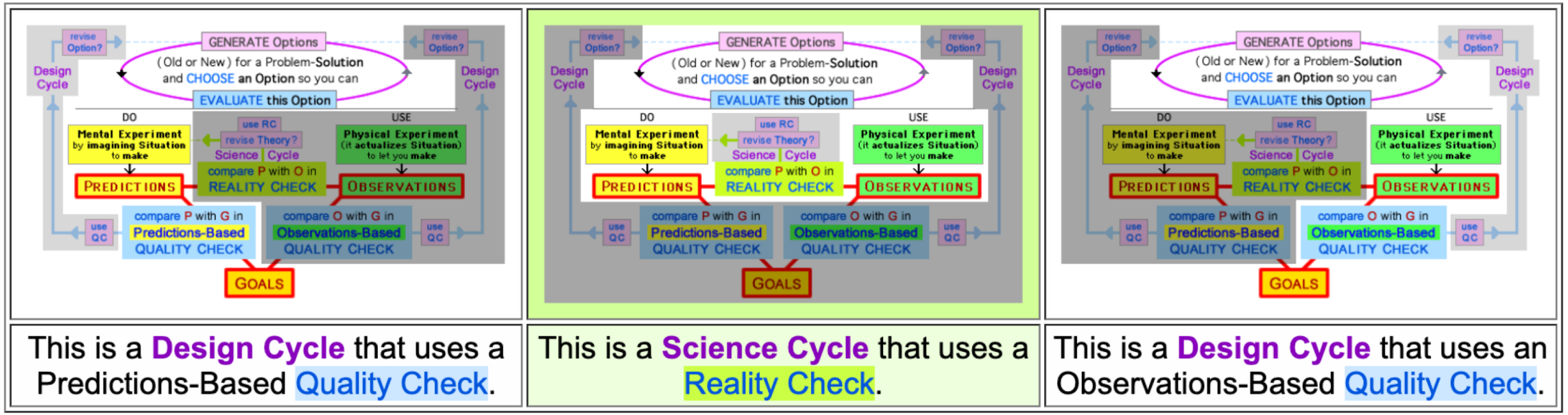
Science Cycle
Mental Experiment
by imagining Situation
to make
Physical Experiment
(it actualizes Situation)
to let you make
compare P with O in
REALITY CHECK
PREDICTIONS
OBSERVATIONS
use QC
compare P with G in
Predictions-Based
QUALITY CHECK
compare O with G in
Observations-Based
QUALITY CHECK
use QC
GOALS

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



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.**

note: The following slides – with **green text** – are "rough draft" slides.

You **do different Action-Sequences** — **these three** and others (e.g. by Generating Multiple Options, as in Brainstorm-then-Edit) — **with different choices-of-Actions at branch points** with Options-for-Actions.

You **coordinate your Problem-Solving Process** by **asking** "what is the best way to make progress in my process?" and **deciding "what should I do next"** and **doing** this Action.

How? To make effective Action-Decisions you **combine cognitive-and-metacognitive awareness of your process** (of "**where you are**" and "**where you want to go**" in your process, and knowing when you're at a branch point) **with Conditional Knowledge** about **Options-for-Action** (by knowing **what the Actions are**) and **what each Action can do,** and **the Conditions** (Situations) **when this Action can be useful.**

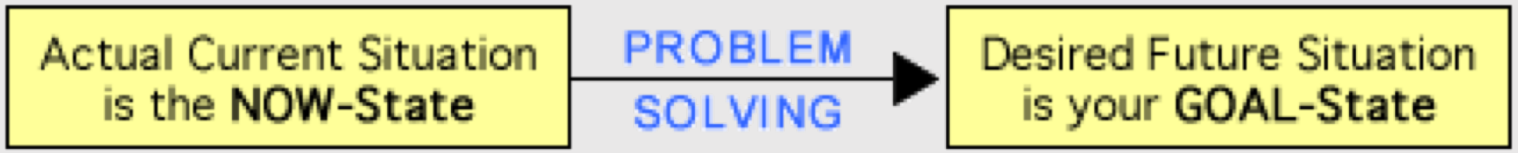
Using the diagrams of Design Process is analogous to **using a roadmap for driving**;
an **external roadmap** is a "big picture overview" of the city's **physical geography** and **your options for driving;** this **helps you form your own internal map** (your **mental map** that's a **mental model,** is a **mental representation**). Similarly, using **Diagram 3** as a "**process-map flowchart**" (showing your **Options for PS-Actions,** and **branch-points in a flow**) helps you understand **cognitive geography.**

With both kinds of maps, **your map-using is temporary.** After awhile, **with experience-by-using you'll KNOW the physical geography** of **the city** (and your options-for-traveling), and **with practice you'll KNOW the cognitive geography** of **Problem Solving** (and **your Options-for-Actions**).

In another metaphor, **view your Actions as problem-solving tools** — like those in the **toolbelt** of a carpenter (or mechanic, electrician, plumber,...) — and **metacognitively using Design Process will help you improve your wise tool-choosing DECISIONS and effective tool-using SKILLS.**

any map is useful only if it's accurate; and **Design Process accurately describes our PS-Process.**

In a "**public domain**" **model-map, simplicity → utility** (practical + educational);
you **understand** "**what is**" in the present **actual NOW-State,** and
imagine "**how it could be better**" in a future **desired GOAL-State:**



Design Process is analogous to **the flexible goal-directed improvising** of a **hockey player,**
but not **the rigid choreography** of a **figure skater.**

Students will **learn more** when they **get more experiences** (that are educationally valuable)
and **learn more from their experiences;** an effective way to **learn more from experiences**
is to **develop-and-use** (so **external map → internal map**) **metacognitive Thinking Strategies.**

metacognition (MC, MC-ive): how? **observe your thinking** and **maybe think about it**
and **maybe evaluate it** and **adjust it.** **--->** **customized MC, re: types & amounts and timings.**

regulate your metacognition: stop-and-go, to **optimize Learning and/or Performing;**
sometimes **stimulate** hi-quality **optimal L and/or P** by **using metacognition productively,**
sometimes **allow** higher-quality **optimal L and/or P** by **avoiding metacognition,**
"**go with the flow**" just **think-and-do** (~~think about thinking~~) with **fully focused attention.**
maybe like **Inner Game of Tennis,** principle of **Performance = + Potential – Interference.**

develop-and-use Metacognitive Knowledge: of TASKS + STRATEGIES + SELF.
e.g. one knowledge of STRATEGIES is knowing usefulness of self-testing (as with digital flash-cards).

LEARN about your MC, know **when & how to use MC** of **different kinds** for **different purposes.**

why? **research** shows **MC** **is highly effective** **for improving** **academic learning** (in **many ways,** including **standardized exam scores**) **and** **social-emotional learning.**

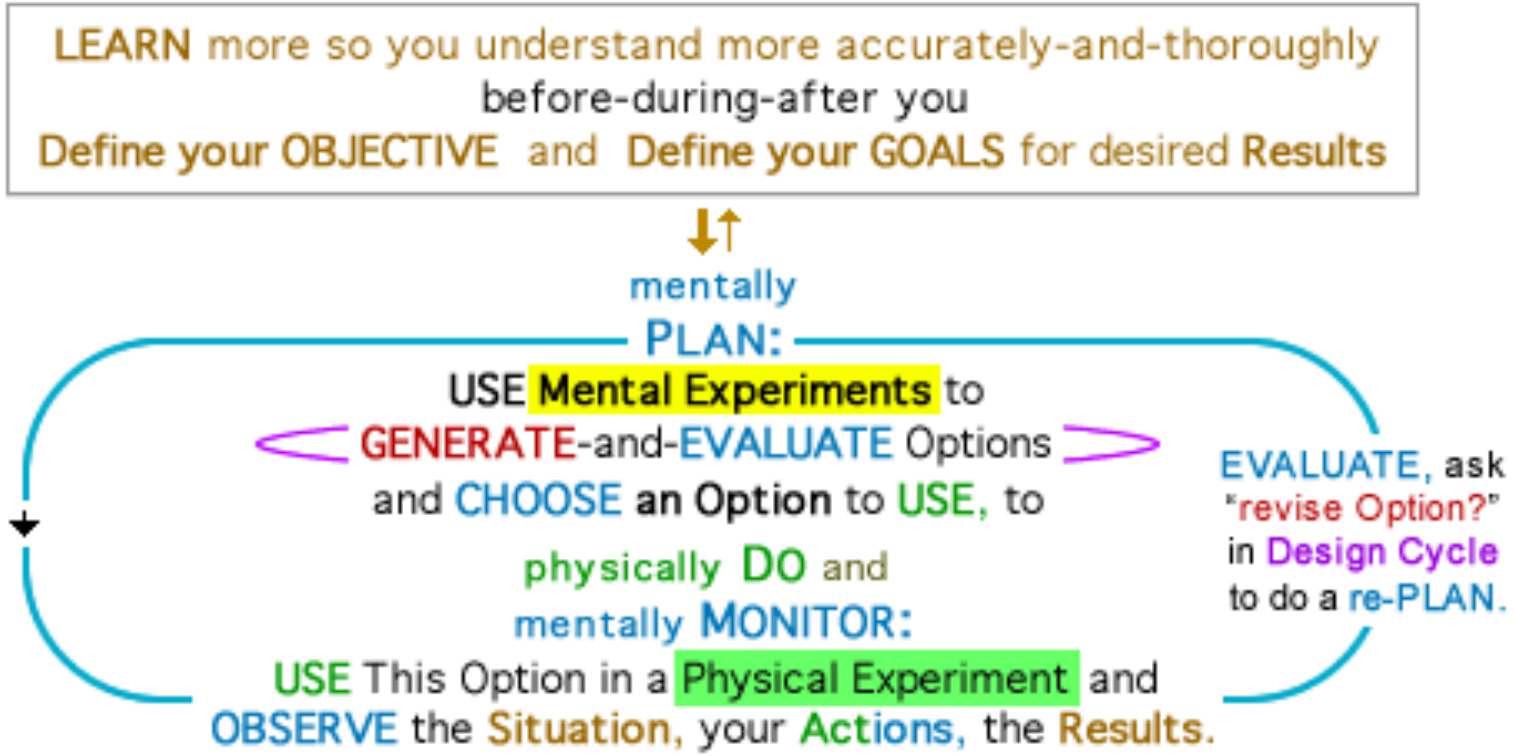
how? research shows **many benefits** **of** **MC Self-Questioning** (**effective**), **and** **MC Self-Regulation** (**more effective**) with **Cycles of Self-Regulated Learning** (**SRL**), and (**most effective**) **combining both.**

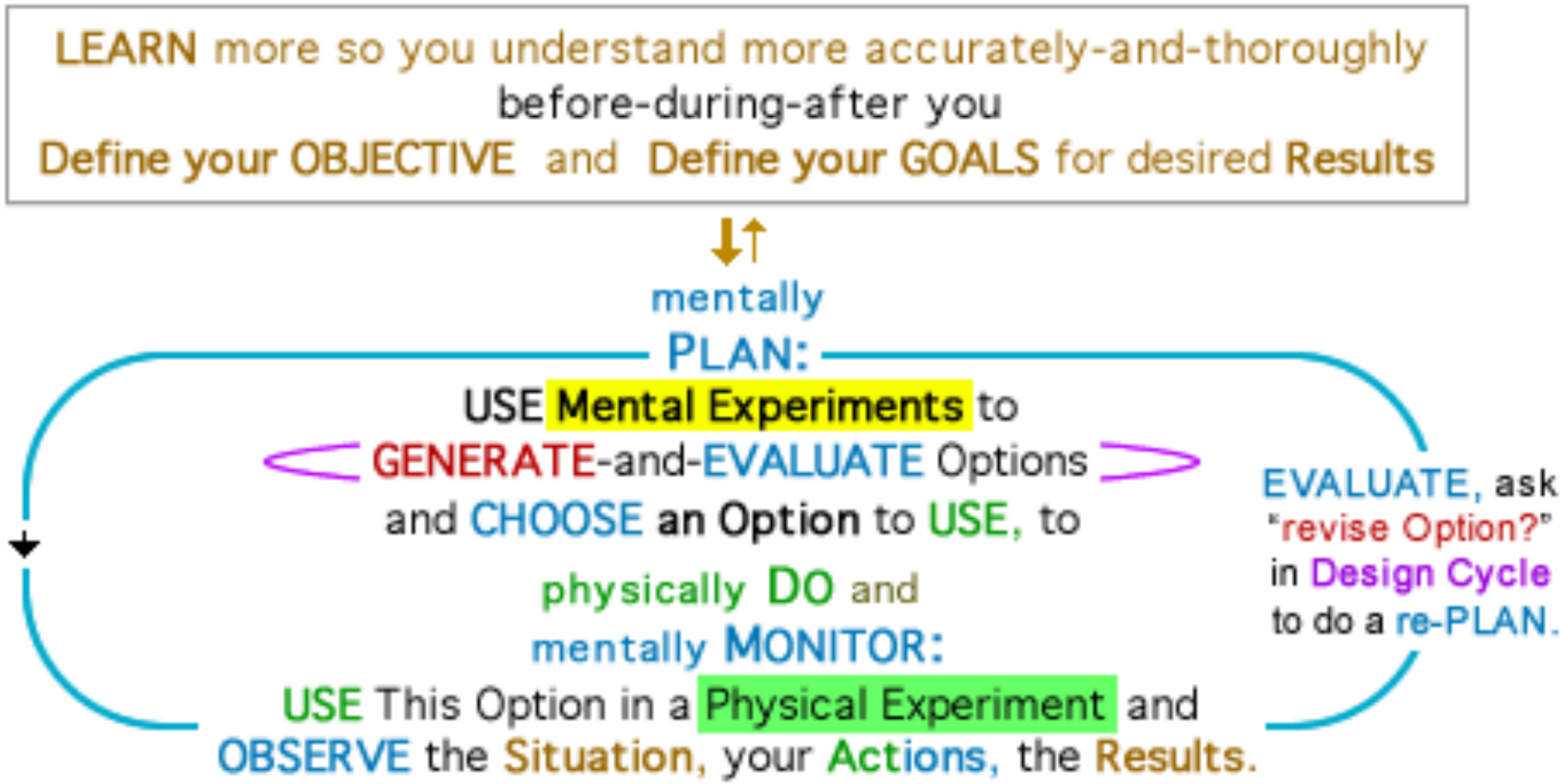
Design Process can → **deeper understandings** **of** **SRL,** as described in next slide.

This diagram shows how the 3-part Cycle of SRL (Plan, Do, Evaluate) requires MENTAL Actions {Plan, Choose, **Monitor** (**Observe**-and-**Evaluate**), revise/Generate} + Learn, Define & Define); PHYSICAL Actions (Use, Do); Use is both, Do-and-Monitor.

Cycles of Design Process (Generate-Evaluate) inside Cycle of SRL (Plan, Do, Evaluate); DP-Cycles (**Mental** Exp, **P-Based** Q-Check), SRL-Cycle (**Physical** Exp, **O-Based** Q-Check.

Monitor is Observe (**initial** Situation –(**your** Actions)→ **later** Results) and Evaluate.




LEARN more so you understand more accurately-and-thoroughly
before-during-after you
Define your OBJECTIVE and Define your GOALS for desired Results
mentally
PLAN:
USE Mental Experiments to
GENERATE-and-EVALUATE Options
and CHOOSE an Option to USE, to
physically DO and
mentally MONITOR:
USE This Option in a Physical Experiment and
OBSERVE the Situation, your Actions, the Results.
EVALUATE, ask
"revise Option?"
in Design Cycle
to do a re-PLAN.

Design Process can help students **develop-and-use effective metacognition:**

how? When I've made a mistake and **asked "why?"** so I could **learn from the experience** (thus **doing self-education**) my self-answer often included "**ineffective process**" because I had not done some Problem-Solving Action(s) effectively. Therefore it can be beneficial to **develop** (proactively) **and use** (consistently) a **Metacognitive Self-Questioning Checklist** for Problem-Solving Actions; **Design Process** is useful for making an MC checklist, because...

As you see in Diagram 3, the structure of **Design Process** (**DP**) is constructed from **cognitive Action-verbs** — learn, define, define; generate, choose & evaluate { (do by imagining to make [to predict], use to make [to observe]) and compare }; use, revise, generate; Choose & Actualize — that we use for **Problem Solving.** During a PS-Process these **cognitive-Actions** can be **supplemented by metacognitive-actions**.
DP can be useful to understand-and-do its own cognitive Actions (for **Problem Solving**) **and also metacognitive actions,** so **DP can be used for cognition-AND-metacognition.**

how? Design Process (**DP**) can help students **deeply understand Cycles of SRL** (that include **Self-Questioning**) and **effectively use Cycles of SRL. (as in next 2 slides)**

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.**

Why should you accept these claims?

A) A wide scope for Problem-Solving **OBJECTIVES** is easy to see — 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) **I'm confident that my model for Design Process** — for the Problem-Solving **PROCESS** **that people use for most things we do in life — accurately describes how people 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 effort & time in their own **Personal Education.**

using **Design Process** leads to **wide scopes for**...

1A) Problem-Solving OBJECTIVES (and thus for **ACTIVITIES**)

1B) Problem-Solving PROCESS.

and 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:**

2A) teach knowledge in multiple contexts;
this is allowed by the wide scope of **PS-Activities;**

2B) 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/Activities.**

a summary of the previous slide:

the book "**How People Learn**"

says that – **to increase transfers** – we should

"teach knowledge **in multiple contexts**" and

"teach knowledge **in a form that's easy to generalize**"

and

both of these can occur with my model

for **Design PROCESS,**

for **Problem-Solving PROCESS.**

Why should you accept my bold claims?

Is there "**PROOF** beyond any 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,...

an acknowledgment of personal humility:

The next four slides describe general principles
you already know, and
(due to your experience with classroom teaching)
you already know (better than me)
how to design Activities
that will be FUN-and-USEFUL for students.

Because we want to build
effective Education Bridges
so students will be motivated to
pursue their own Personal Education,
we want to design PS-Activities that have
wide variety (this is possible due to **the wide**
scope-for-Activities with Design Process)
so the PS-Activities will be
FUN and USEFUL.

Designing Activities that are FUN and USEFUL:

FUN (with **intrinsic experience**) happens when activity has
fun TOPIC that is interesting (as defined by student),
fun ACTIONS that are interesting (as defined by student).

FUN (with result-of-success) when student
anticipates success, and **achieves** success.
So this happens more often, design activities with
appropriate **level of difficulty** (not too easy, not too hard)
a well designed **PS-Activity** is similar (re: difficulty) to a
a well designed **mystery story** — so most students are
not bored (if too easy) and **not frustrated** (if too hard).

What is USEFUL? This is defined by a student:

During an Activity, a student will **perceive USEFUL-ness** when they **think & feel** (in their **thoughts & emotions**) that the Activity **will be USEFUL** for **their own future life** – their **near** future (after school), **medium** future (next year), and **far** future (as an adult) – because they're believing that what they are doing-and-learning will be **Personally Useful** in their own lives, and this belief **motivates them** to pursue their own **Personal Education.**

They are being motivated by their imaginings of **TRANSFERS Across Areas** (from **School** into **Life**) and **TRANSFERS Through Time** (from **Present** into **Future**).

A student's **perception** of **Personal Useful-ness**
provides their **motivation** for **Personal Education.**

Here are some useful **self-education strategies**
(that you already know) for **Personal Education:**

- develop and use (with consistency) a **Growth Mindset,**
- try to learn from every experience (good or bad)
with a proactive attitude of **Intentional Learning,**
- believe that **better Learning NOW**
will lead to **better Performing LATER,**
- develop-and-use a metacognitive **Checklist** for **Problem Solving.**

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 their School-Life improves their Whole Life
because **better Education** produces a **better Life;**
making Their Education better will **make Their Life better.**

Personal Education: Area-Transfers & Time-Transfers:

When students decide to proactively 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 in ways they want?**

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.

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.

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.**

teaching WITH metacognition and **teaching FOR metacognition:**

Most teachers are skilled in **teaching with metacognition**, by using **self-metacognition** plus valuable **other-metacognition,** i.e **empathy**.

Some aren't confident in **teaching for metacognitions** by modeling, explaining, encouraging **MC.** {but they can use their growth mindset with learning by PD, and on their own, and during classroom teaching.} A teacher can "learn enough" fairly quickly, and this will help students. Then they will gradually develop skills that are wider and deeper.

re: learning **Design Process,** if they look at Diagram 3 — and think "this is complex, it will be difficult to learn" — they will self-overcome their concern when realizing it's easy because **they will learn in steps** (with Diagrams **1** & **2**, then **3**) and due to **the logical organization of Design Process,** and with Recognition Learning when they recognize that **the PS-Actions of DP** are **Their PS-Actions** so they don't have to "learn" new ideas, they can just connect familiar PS-Actions to DP.

We can **build bridges** (**from School into Life**) as described earlier, **AND motivate with metaphors:** Teachers can encourage students to...

"**drive your brain**" and "use growth mindset to imagine the excitement of seeing increases in **your brain-driving skills** (like race car driver) and **your brain's performance** (like increasing car's horsepower & torque, handling capabilities)";

"**be CEO of Your Thinking**" with **executive control,** by skillfully using **Metacognitive Thinking Strategies;**

"**be CEO of Your Life**" – **Design your Life** with wise decisions about using time and opportunities, to more effectively pursue your **Goals for Life.**

"**enjoy adventures with thinking**" – "explore the world of thinking" when you DO Problem-Solving Activities that are Fun and Useful, and LEARN about thinking. (as in the "levels" of my website, and in other ways; e.g. use AI to generate deep-and-wide research reports)

gifted students **enjoy thinking** and
expect it to be valuable part of their life,
→ they will be **motivated to learn-and-do Metacognition**,
for their own benefit.

Teachers mainly use metacognition for the benefit of students,
because a teacher's metacognition (for self + student-empathy)
will help them become better teachers.

many **gifted students:** **excited** about **exploring** **adventures of thinking.**
teachers **also excited** about adventure, but **have time-pressures.**
I could be wrong; **if my Personal Theory fails a Reality Check** (because
My Predictions don't match **Your Observations**) **I'll want to learn from you**.
Maybe... **students** tend to be in **EXPLORING MODE** (**seek adventures, Yes**);
and **teachers** tend to be in **FILTERING MODE** (**protect valuable time/life, No**).

in my website — Education for Problem Solving —
a major part of the HomePage is asking
What kind of Knowledge-and-Skills Curriculum
will produce optimal Whole-Person Education?
(iou – tonight I'll make a link to this set of related sections)
to examine reasons for saying "yes" or "no" to instruction
that uses more Problem Solving & Metacognition

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**.

My Model and Other Models:
Cooperation, not Competition

My Model **with** Other Models,
not
My Model **versus** Other Models.

We should develop instruction to creatively combine different Models-for-Process, so **the combination is more effective than any single Model by itself.**

STRUCTURES **+ STRATEGIES**
STRUCTURES (for Instruction) **+ STRATEGIES** (for Thinking)

My Model and Other Models:

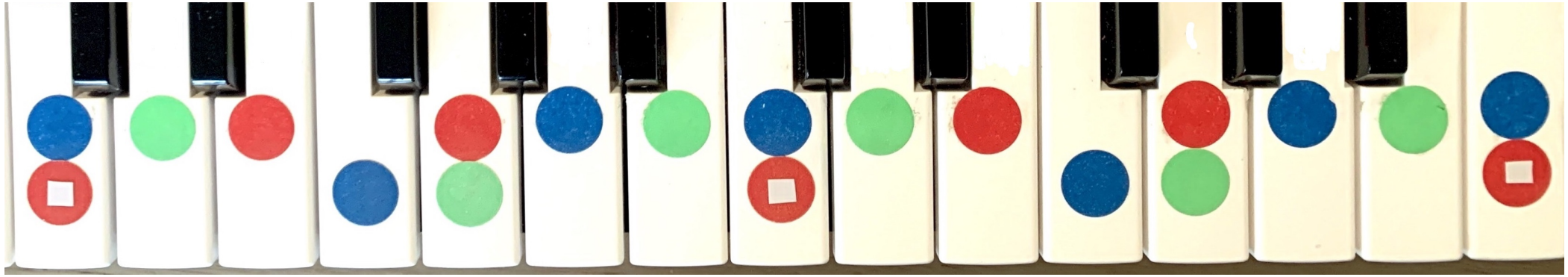
We should develop instruction that combines different Models-for-Process creatively, so the combination is more effective for teaching ideas-and-skills. We want the Models to interact in ways that are synergistically supportive, that make the combination of Models better than any Model by itself.

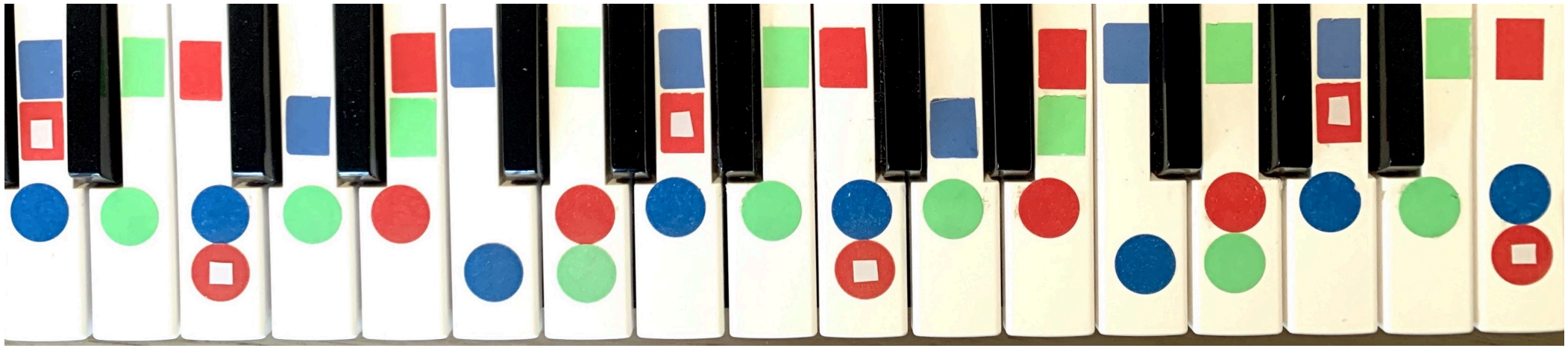
Structures and Strategies: Typically, a Model-for-Process is educationally useful by providing **structures** (for instruction) and **strategies** (for thinking). Each Model has structures & strategies, so each offers its own benefits for students. When we effectively combine the structures & strategies from two (or more) Models, we combine their benefits.

Using Model-Structures to provide Structure for Instruction:

Jeremy Utley, Director of Executive Education for Stanford's d.school, explains how their model [the next slide shows its 5 Modes] provides "a shared language and a shared approach" that can be "a useful scaffold to structure an experience for the purpose of learning."

When students work in groups and everyone is thinking about the first *mode* (Empathize) in d.school's model, this whole-classroom focus makes it easier for a teacher to share ideas and guide students so they can use-and-understand the tools in this mode, so they will learn how to empathize more effectively using d.school's *mindset* of Focusing on Human Values. After awhile all students move on to the next mode (Define), and so on, in their "experience for the purpose of learning." And a teacher will use "the phases" with flexibility when it's useful.

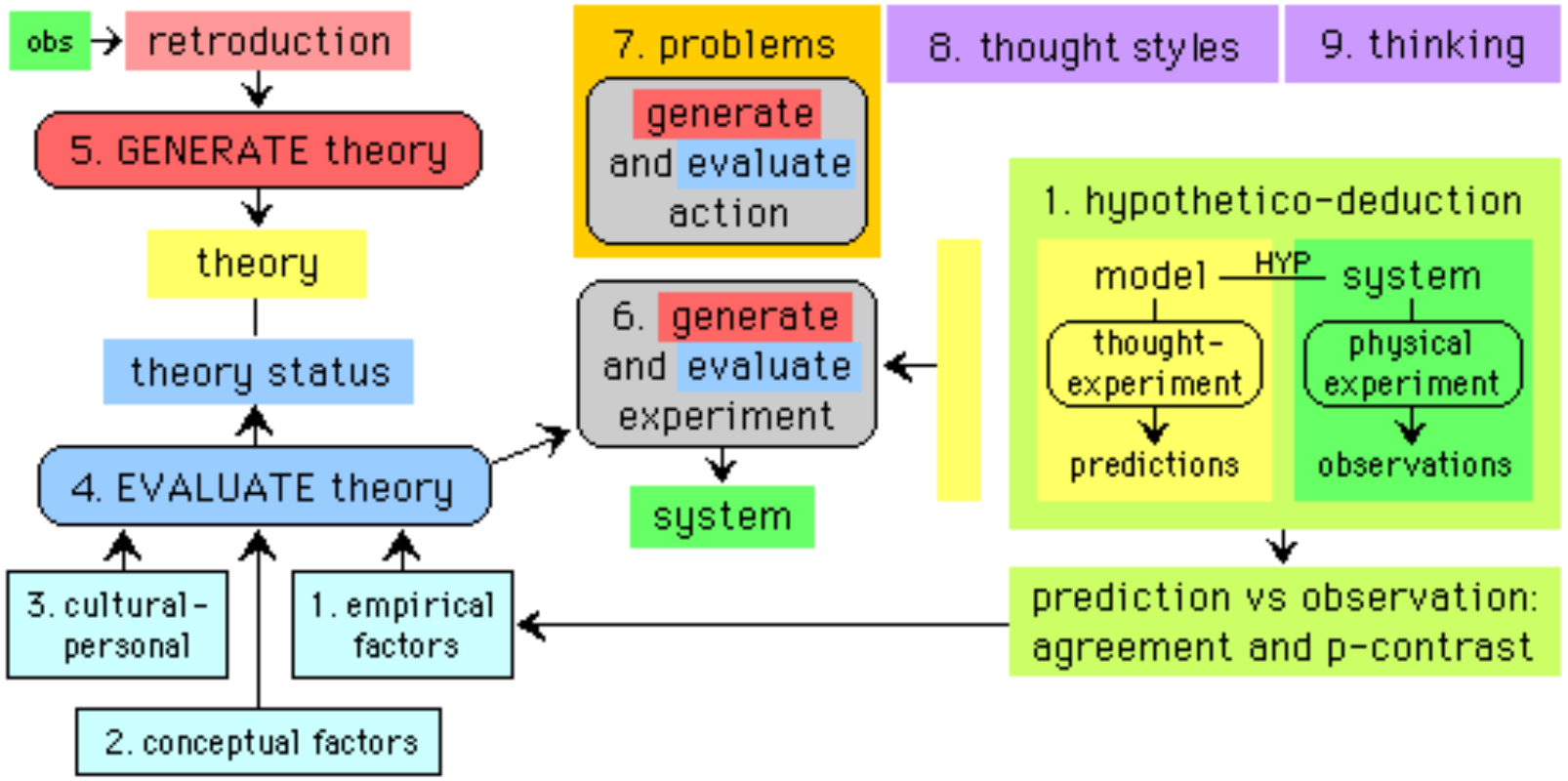


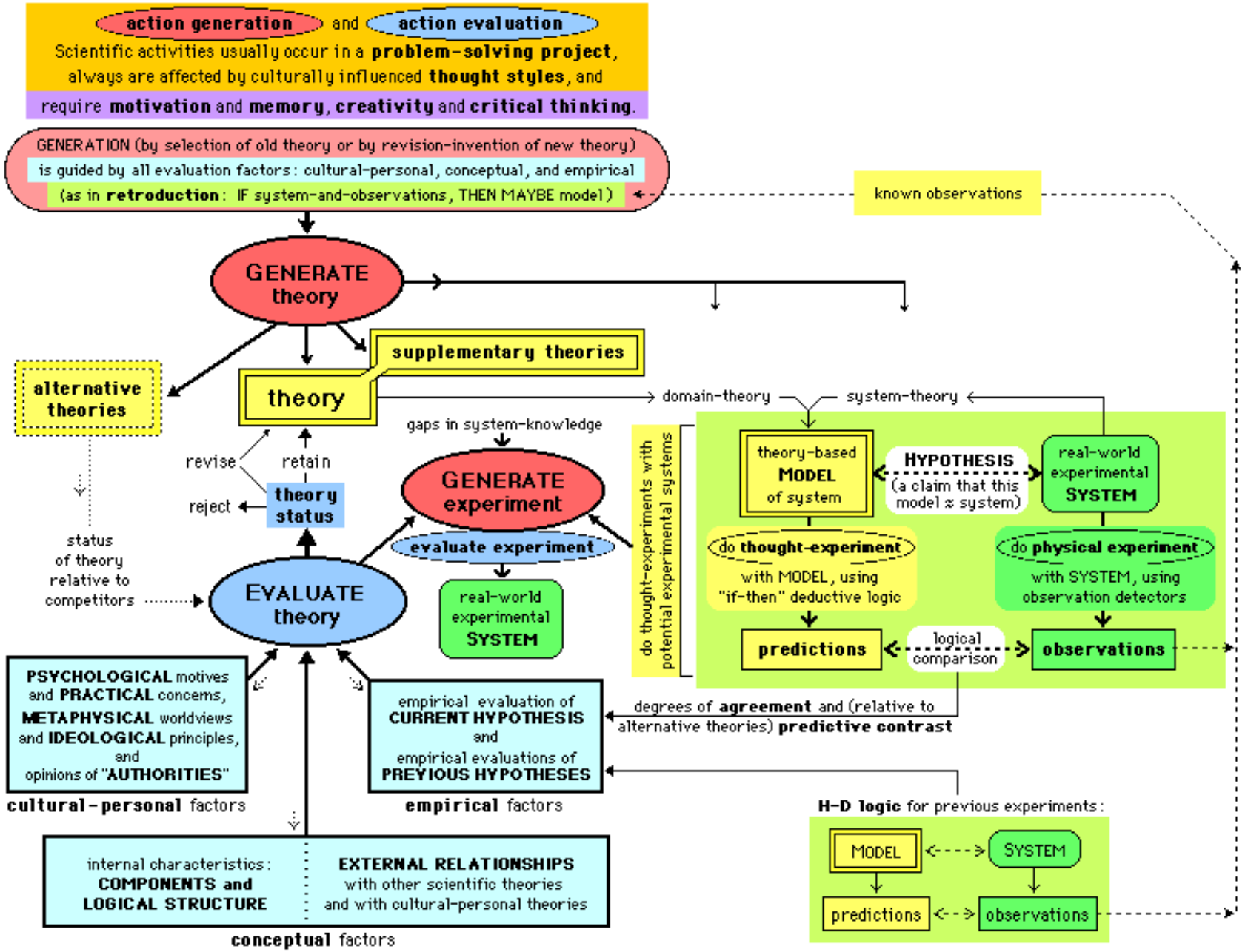


This a condensed mini-version of the model I developed for my PhD Dissertation.
The next slide has the full-detail version of the diagram I made for

Integrated Scientific Method

that is described (briefly & deeply) in a collection of web-pages and word-documents.




action generation and action evaluation
Scientific activities usually occur in a problem-solving project, always are affected by culturally influenced thought styles, and require motivation and memory, creativity and critical thinking.
GENERATION (by selection of old theory or by revision-invention of new theory) is guided by all evaluation factors: cultural-personal, conceptual, and empirical (as in retroduction: IF system-and-observations, THEN MAYBE model)
known observations
GENERATE theory
supplementary theories
theory
alternative theories
domain-theory
system-theory
gaps in system-knowledge
revise
retain
reject
theory status
GENERATE experiment
evaluate experiment
real-world experimental SYSTEM
status of theory relative to competitors
EVALUATE theory
do thought-experiments with potential experimental systems
theory-based MODEL of system
HYPOTHESIS (a claim that this model ≈ system)
real-world experimental SYSTEM
do thought-experiment with MODEL, using "if-then" deductive logic
do physical experiment with SYSTEM, using observation detectors
predictions
logical comparison
observations
degrees of agreement and (relative to alternative theories) predictive contrast
PSYCHOLOGICAL motives and PRACTICAL concerns, METAPHYSICAL worldviews and IDEOLOGICAL principles, and opinions of "AUTHORITIES"
cultural-personal factors
empirical evaluation of CURRENT HYPOTHESIS and empirical evaluations of PREVIOUS HYPOTHESES
empirical factors
H-D logic for previous experiments:
MODEL
SYSTEM
predictions
observations
internal characteristics: COMPONENTS and LOGICAL STRUCTURE
EXTERNAL RELATIONSHIPS with other scientific theories and with cultural-personal theories
conceptual factors