<u>**Using Design Method for Problem Solving & Metacognition**</u>

<u>**Problem**</u> **=** an opportunity to make things better

<u>**Problem Solving**</u> **=** moving from NOW-state to desired GOAL-state

<u>**Design**</u> **=** solving problems by designing better products, activities, strategies, theories; this **includes almost everything we do in life**.

<u>Design Method</u> = way to improve Understanding & Teaching, to
1. accurately describe the methods used in design & science, thus improving our **UNDERSTANDING**.   (achieved? <u>yes</u>)
2. help students improve their thinking skills & thinking methods, thus improving our **TEACHING**.   (achieved? <u>potentially yes</u>)

<u>**ACTIVITIES for INSTRUCTION**</u>

<u>**Inquiry**</u> **=** activity where students **explore**, try to **solve problems:**

<u>design-inquiry</u> — if the objective is a product, activity, or strategy,
<u>science-inquiry</u> — if objective is a theory (= guided discovery?),

<u>design activities</u> — first-hand experience (students solve problems) and second-hand experience (case studies of other problem solvers)

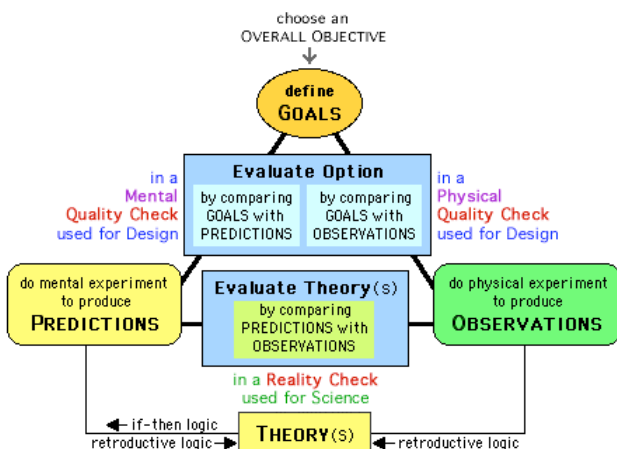<u>**Teaching Design Method**</u> with a Simple-to-Complex Progression:

1. Two-Step Cycle — **Generate** Options & **Evaluate** an Option,
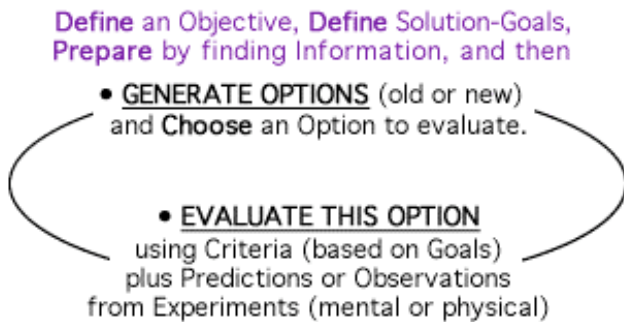
2. Three Ways to compare Goals, Predictions, Observations:

Quality Check – compare Goals with Predictions or Observations
Reality Check (Theory Check) – Predictions versus Observations

3. in an **optional stage** (a teacher decides how much to explore), **explain the 9 Modes for Improvised Thinking-and-Action:**

DEFINE — choose a design-objective, define goals for solution
GENERATE — old info, new options, predictions, observations
EVALUATE — by using Quality Checks & Reality Checks
COORDINATE — by making action-decisions for all 9 Modes

In addition to decisions about progressions (especially re: modes), a teacher can also decide how to teach about **optimal blendings** of **creative-and-critical thinking** & **cognition-and-metacognition**.

• A teacher can also decide how to explore **optimal blendings** of **creative-and-critical thinking** & **cognition-and-metacognition**.

Using Metacognition in Education for Problem Solving:
<u>metacognition</u> **=** "thinking about thinking" with the objective of improving your thinking-and-learning skills.

<u>**Metacognitive Self-Education**</u> **=** when students are motivated to use a problem-solving approach to personal education, to improve their lives by moving from their **now-state** (of current knowledge) to a future **goal-state** (of improved knowledge).

<u>**Learning Strategies**</u> — combine cognition-and-metacognition in a design process to observe and improve learning/thinking **strategies** (in <u>Quality Checks</u>) & **strategy-applications** (in <u>Quality Controls</u>):
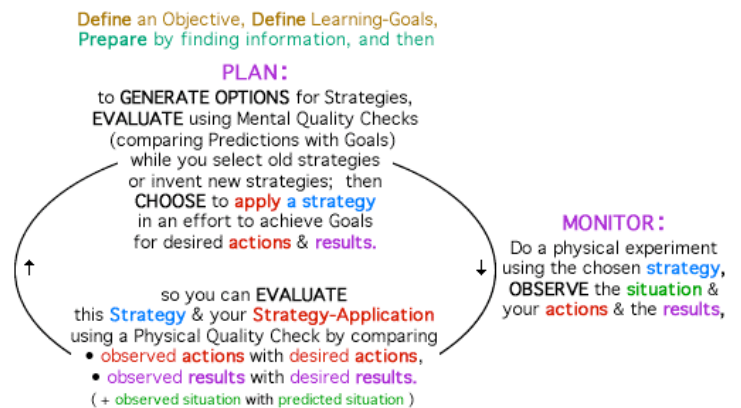
<u>**Teaching Strategies**</u> — a teacher (or coach, supervisor,...) can
• motivate students to **use Self-Education**, help them **do it better**;
• use design-process to **improve teaching**: define Goals for ideas-and-skills we want students to learn, design **Learning Activities** to provide experiences with ideas/skills, and **Teaching Methods** (guiding to adjust difficulty level and direct attention to learning opportunities,...) to help students learn more from experiences.