2.5 Creativity I

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In the previous sequence, it was shown how estimation can be used by experienced engineers to find fast, yet reasonable and logical, answers to problems.

In this sequence, creativity will be defined, creative skills will be outlined, and the creative problem solving steps will be provided.
Creativity
Creativity Defined

- Creativity is the ability to invest with a new form, produce through imaginative skill, and bring into existence something new.

- Creativity is the ability to challenge assumptions, break boundaries, recognize patterns, see in new ways, and make new connections when solving problems.

- Creativity is an intuitive process for discovery that sometimes end in a product or a process.
How to be creative?
How to be creative?

1. Be an expert
   - Gather technical and intellectual knowledge.
   - Know all you can about a problem.

2. Seek knowledge in all disciplines
   - Keep Engineering Toolbox in your brain.
   - Broaden your interests
How to be creative?

3. Write and draw
   - Keep a notebook.
   - Sketch, draw and diagram
   - Model using computers.

4. Practice
   - Solve different problems.
   - Design different systems.
   - Explore physical objects and events.
   - Look for associations, similarities and differences.
How to be creative?

5. Think freely
   - Imagine and visualize.
   - Generate many ideas.
   - Move beyond the obvious solution.
   - Think out of the box

6. Don’t be afraid to be different
   - Think Independently.
   - Question assumptions.
   - Evaluate information critically.
   - Take risk.
How to be creative?

7. Be curious
   • Ask why.
   • Look for improvements.
   • Learn from accidents.

8. Be motivated
   • Have inner passion and drive to solve problems.
   • Invest in time.
   • Exert effort.
   • Commit.
How to be creative?

9. Reflect
   - Think about what you did.
   - Re-think.

10. Enjoy
    - Enjoy *Engineering*.
    - Take your time.
    - Work away from stress.
Creative Problem Solving

- Approaches for problem solving suitable for group-work have been developed under the name of Creative Problem Solving (CPS). *Osborn-Parnes*

1. Fact finding.
2. Problem finding.
3. Idea finding.
4. Solution finding.
5. Acceptance finding.

Reference: *Creativity for Engineers* by Rene Vidal
Creative Process: Fact Finding

- Observe carefully and objectively while collecting information about the problematic situation in order to explore and identify the facts of the situation.

Creative Process: Problem Finding

- Clarify the challenge or problematic situation by considering different ways of regarding and reflect on those possibilities.

- Action: *In what ways might we...? How do we...?*
Creative Process: Idea Finding

- Look for more diverse ideas and options, and use various methods and techniques (divergent thinking).

- Action: Make new relationships, associations, connections, magnify, minify, combine, rearrange, change, reverse, turn upside down, and inside out.
Creative Process: Solution Finding

- Examine ideas in new and different ways in order to select and/or combine ideas to create a plan of action (convergent thinking).

- Action: Effect on whom? Effect on what? How to improve?
Creative Process: Acceptance Finding

- Develop a plan of action in order to seek ways of making the solution more workable, acceptable, effective, and beneficial.

- **Action:** What objections will different groups have with the idea/plan? How might be set this plan into action? Who is going to do that?
Conclusions

- Creativity is to be the ability to challenge assumptions and break boundaries in order produce innovative solutions.

- Being creative involves many aspects, 10 of which were described.

- Creative Problem Solving includes: fact finding, problem finding, idea finding, solution finding, and acceptance finding.