2.5 Creativity I

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Preview

- 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.

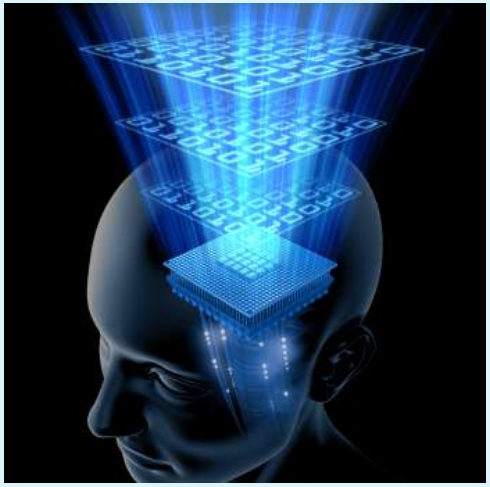
- Creativity is an intuitive process for discovery that sometimes end in a product or a process.

How to be creative?

How to be creative?

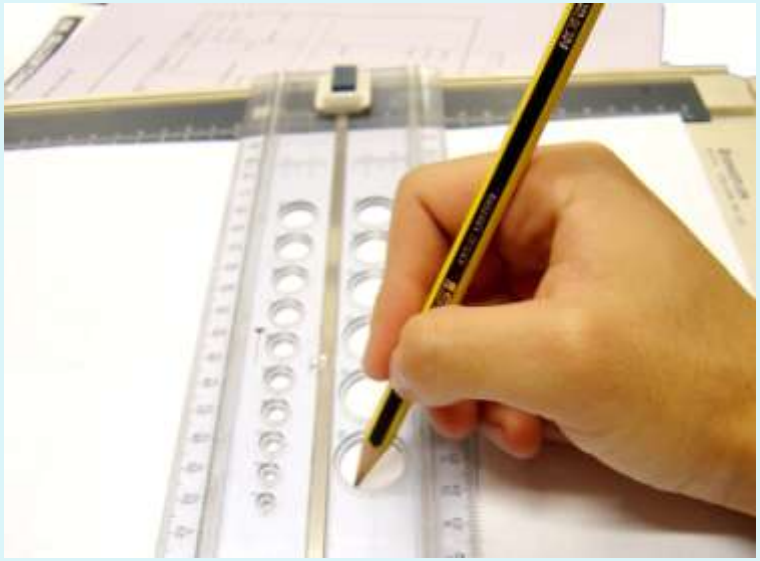
1. Be an expert
   - Gather technical and intellectual knowledge.
   - Know all you can about a problem.

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.

- *Action: Who? What? Where? When? Why? How?*

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.