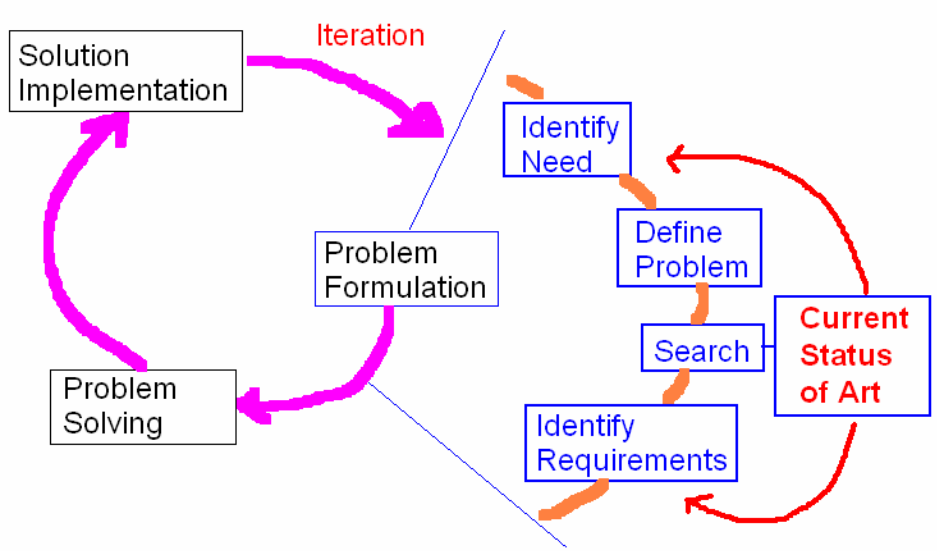
Problem Formulation and Design Requirement

- **Contents**
  - Identify Needs
  - Define Problems
  - Current Status of Art
  - Identify Requirements



- **Goals**
  - Why need identification and problem definition are important
  - Strategies for gathering information about a problem
  - Develop a set of requirements for a problem

Problem Formulation Stage

- "The process of converting a dissatisfied situation into a well-understood problem"
  - Understanding the problem to be addressed
  - Not finding solution to the problem
  - It's result?
    - Clear set of requirements that can guide the design process through to its completion

Identifying Needs and Defining Problem

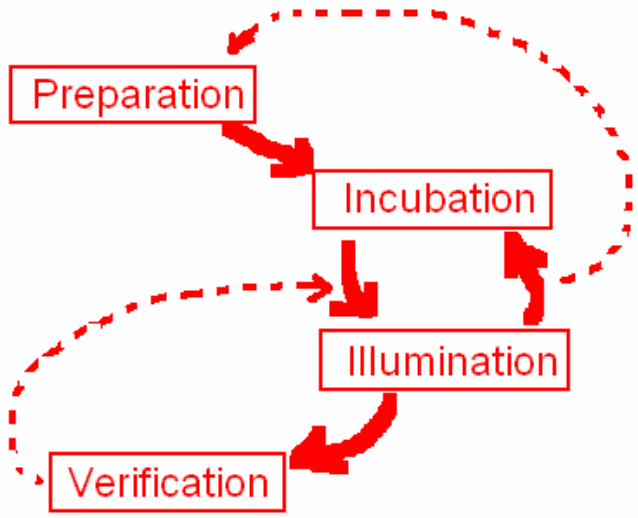
- **Identify Needs**
  - Pioneer Mentality
  - Identifying a need and accepting responsibility for meeting it
  - Commit time, energy, other resources
  - Take risks
  - Willingness to adapt to situation and use available resources
  - Agent of change
- **Search for Current Status of Art**
  - Patent Search
  - Web Search
  - Market
- **Defining Problem -No Rush to get a solution** after identifying needs:
  - A wrong problem may be solved!
  - A symptom (a clue about the problem) may be solved!
  - A part of the problem may be solved!
  - **Powerful approach?**
    - **Brainstorming**
    - **Creation of Affinity Diagram**
    - **Creation of Cause-and-Effect Diagram**

Side Bar-Brainstorming

- Unleashing Your Creativity- "How can one gain better access to his or her creative energy?"
- Creativity as Process
  - Preparation: Ground work. Background of the situation
  - Incubation: Taking time out. A rest period.
  - Illumination: Getting the answer (Aha!). The light bulb is on! Generate Ideas.
  - Verification: Does the idea work? Confronting and solving the practical problems.

Fill in the missing number.

5	6	7	8	9
52	63	94		18

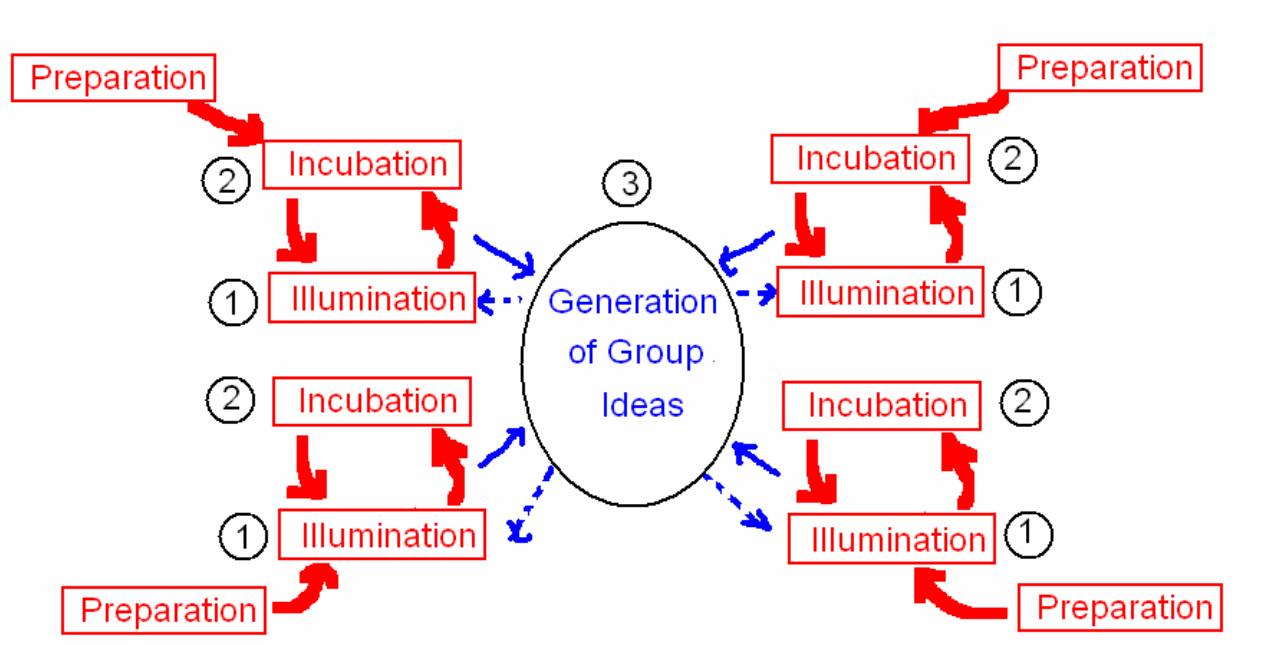


Side Bar - Brainstorming

- A group process
- Popularized but misunderstood –
  - Not just “sitting down and thinking of idea
- A process with guiding principles
- Primary Goal
  - Generation of a large quantity of ideas –
- Core Elements
  - No judgment of other people’s ideas is al
  - No judgment of your own ideas is allowe
  - Build onto the ideas of others
  - Welcome wild ideas
- People Involvement
  - Gather a diverse team of people
  - Designate a facilitator
  - Keep everyone involved

Side Bar - Brainstorming

- Team Idea-generation Strategy
  - Illuminate the first time individually: “generate ideas”
  - Incubate: “set the problem aside”
  - Presentation of individual ideas and build on them in group brainstorming
  - Incubate
  - Generate ideas as a team, and cycles of incubation-illumination- until….



Side Bar - Attributes of Creative People

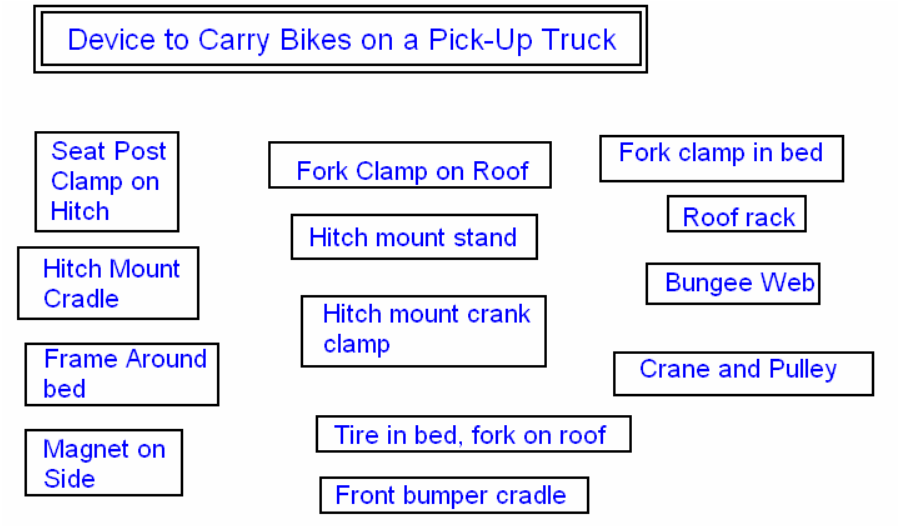
- Discipline and Self-C
- Adaptability and Res
- Conceptualization an
- Flexibility and Fluenc
- Visualization Ability
- Curiosity
- Comfort with Comple
- Mental Agility, detach
- Skeptical of Accepte
- Persistence and Cap
- Informality
- Originality

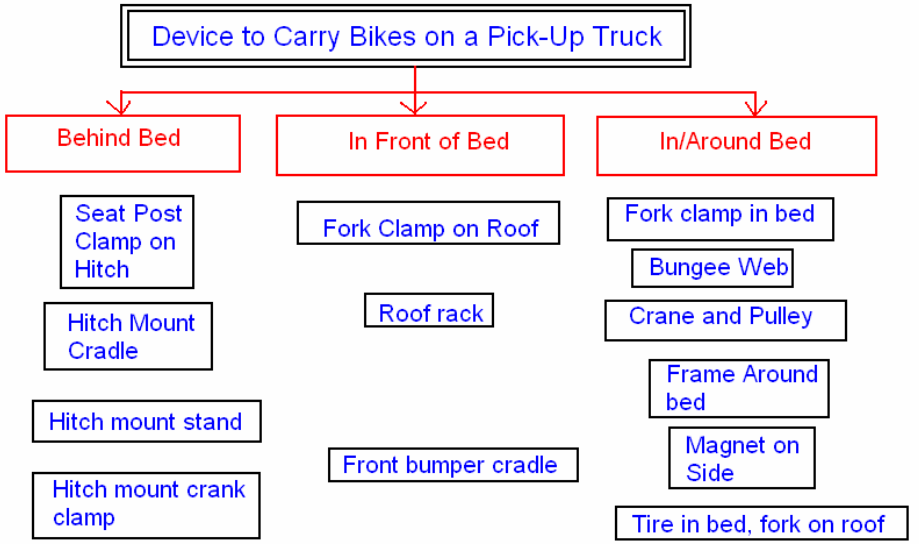
Side Bar - Attention-Directing Tools

- Affinity Chart
  - Team has a big list of ideas (after brainstorming) and is not sure what to do with it
  - Grouping similar ideas into **categories**
- Fishbone Diagram
  - Team wants to identify **causes** for a problem
    - Examples:
      - What are all possible safety issues with the design?
      - Why are meetings always so unproductive?

Side Bar - Affinity Chart

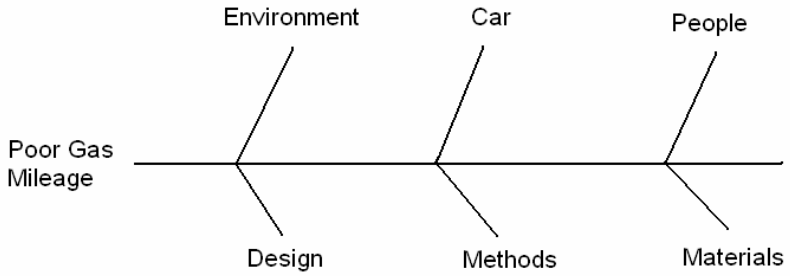
- Groping Ideas into Categories
  - Generate Ideas
  - Sort the ideas
  - Create Headings
  - Draw an Affinity Diagram

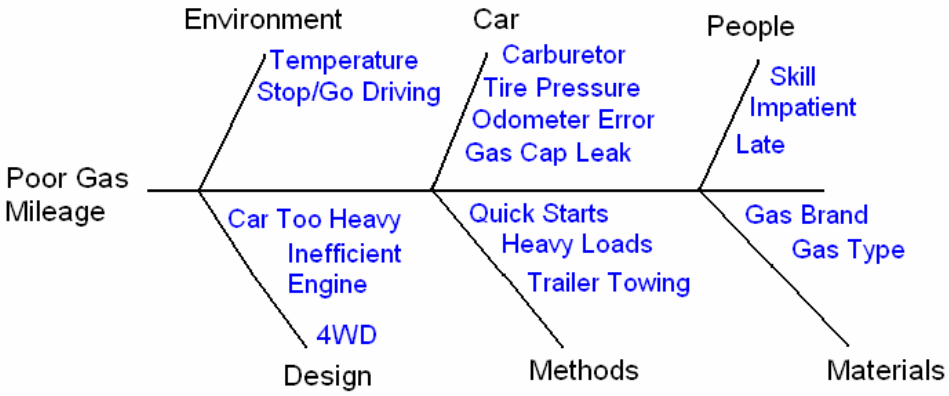




Side Bar - Fishbone (Cause-and-Effect) Diagram

- The opposite of Affinity Chart
- Start from Categories and Ideas are found to fit within each category
  - Develop a problem statement
  - Construct an empty fishbone diagram with major cause categories identified
  - Generate ideas for each category
  - Identify most likely causes





Class Activity

- Form a Group (temporary)
- *Define the needs* and *Identify the problem* of "Method and Idea of E-Waste Reduction" by
  - Individual Idea Generation (5 minutes)
  - Brainstorming (20 minutes)
  - Affinity Chart OR Fishbone Diagram (10 min)