

# Brainstorming for ICOM 5047 Capstone in Computer Engineering

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Conference Sponsor: SIE

# Brainstorming?



# Recall our last presentation

- ICOM 5047: Capstone in Computer Engineering
  - Work in groups
  - Undertake a Major Design Experience
  - Hardware and Software Components
- Faculty
  - Fernando Vega
  - Miguel Figueroa
  - Nayda Santiago
- Customers
  - Dani Santiago – beisbol project – database and units
  - Rafael Rodriguez – EMAG project – sensor data collection

# Outline

- Brainstorming
- Concept Map

# Goal

- Our goal is to form Capstone groups which will be able to generate a set of ideas to solve a particular large problem and start working on the solution of the problem.



# Brainstorming

- Group Creativity Technique
  - Generate ideas for solution of a problem
  - Used since 1930
  - Proven
    - Brainstorming is more effective than individuals working independently [1-3].

[1] Nijstad, B. A., Stroebe, W., Lodewijckx, H. F. M. (2003). Production blocking and idea generation: Does blocking interfere with cognitive processes? *Journal of Experimental Social Psychology*, 39, 531-548.

[2] Diehl, M., & Stroebe, W. (1991). Productivity loss in idea-generating groups: tracking down the blocking effect. *Journal of Personality and Social Psychology*, 61, 392-403.

[3] Mullen, B., Johnson, C., & Salas, E. (1991). Productivity loss in brainstorming groups: a meta-analytic integration. *Basic and Applied Social Psychology*. 12, 3-23.

# Brainstorming Rules

- Focus on quantity
  - The greater the number of ideas generated, the greater the chance of producing a radical and effective solution
- No criticism
  - The participants focus on extending or adding to an idea
    - Reserving criticism for a later 'critical stage' of the process
    - By suspending judgment, one creates a supportive atmosphere where participants feel free to generate unusual ideas

# Rules (cont.)

- Unusual ideas are welcome
  - Unusual ideas
    - may open new ways of thinking and provide better solutions than regular ideas
    - can be generated by looking from another perspective or setting aside assumptions
- Combine and improve ideas
  - Good ideas can be combined to form a single very good idea.
    - $1+1=3$
  - lead to better and more complete ideas than merely generating new ideas alone
    - stimulate the building of ideas by a process of association

# Outline of the method

- Set the problem
- Create a background memo
- Select participants
- Create a list of lead questions
- Conduct Session

# Part I: Define the problem

- Problem must be clear
  - not too broad
  - capture the problem in one question
  - if it is too big: divide into smaller questions
  - the purpose of writing a definition is to establish accuracy and clarity in the scope of your project
  - involves determining the problem's characteristics, limitations, and applications

## Part II: Background Memo

- Invitation and informational letter for the participants, containing the session name, problem, time, date, and place
- The problem is described in the form of a question, and some example ideas are given.
- The memo is sent to the participants at least two days in advance, so that they can think about the problem beforehand

## Part III: Select participants

- Compose the brainstorming panel
  - Consists of the participants and an idea collector
  - Ten or fewer group members
    - generally more productive than larger groups
- Suggestion
  - Several core members of the project who have proved themselves.
  - Several guests from outside the project, with affinity to the problem.
  - One idea collector who records the suggested ideas

## Part IV: List of lead questions

- The leader should stimulate creativity by suggesting a lead question to answer
- Ask how to combine ideas
- Look from different perspectives

# Conduct the Session

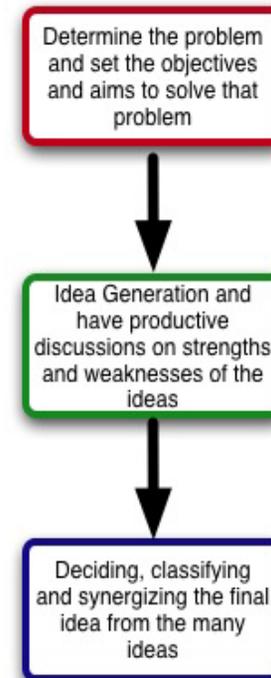
- There are basic rules
- Respect other ideas
- Everyone should participate

# Basic Rules

- The leader presents the problem and gives a further explanation if needed.
- The leader asks the brainstorming panel for their ideas.
- If no ideas are coming out, the leader suggests a lead to encourage creativity.
- Every participant presents his or her idea, and the idea collector records them.
- The participants try to elaborate on the idea, to improve the quality.
- When time is up, the chairman organizes the ideas based on the topic goal and encourages discussion.
- Ideas are categorized.
- The whole list is reviewed to ensure that everyone understands the ideas. Duplicate ideas and obviously infeasible solutions are removed.
- The leader thanks all participants and gives each a token of appreciation.

# Exercise

- Brainstorm on either Dani's or Rafael's problem. You may also bring up your own problem.
  - Define the problem
  - Compose your group
  - Create lead questions
  - Conduct a brainstorm session



**Workflow of a Brainstorming Session**

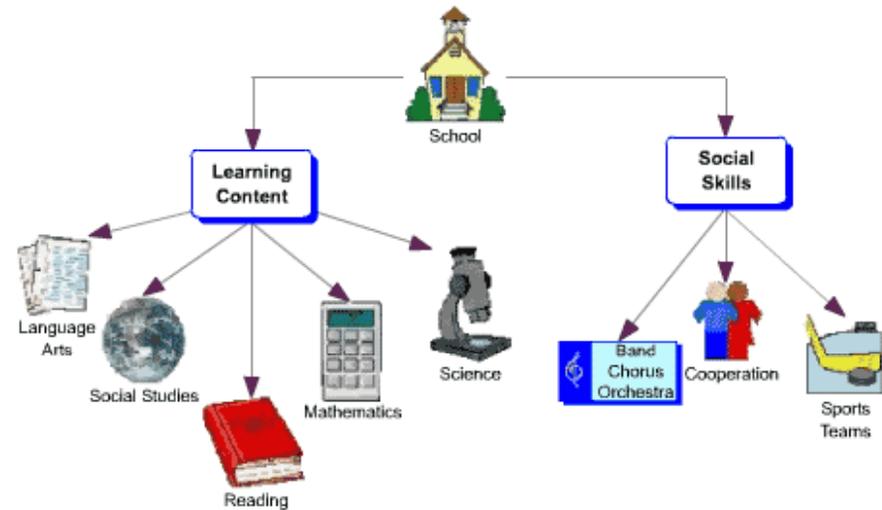
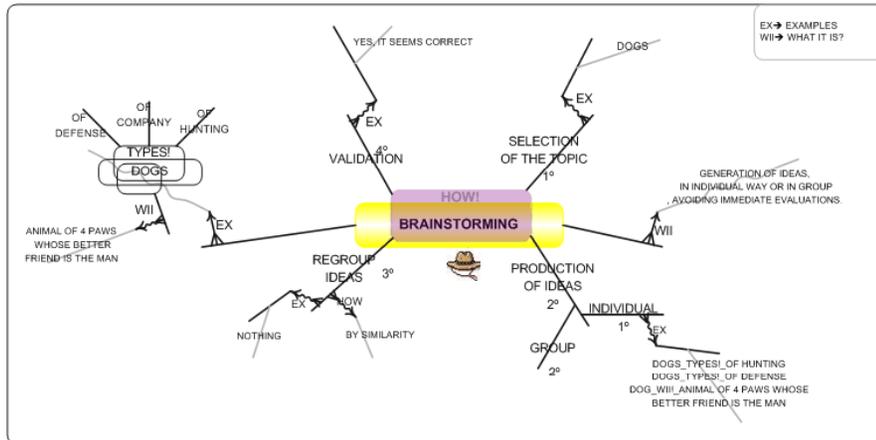
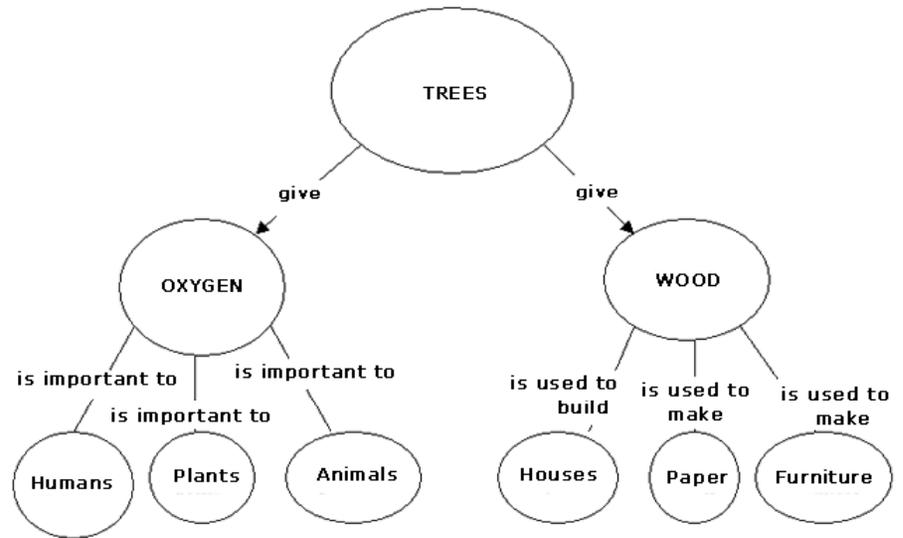
# Variation: Brain Write

- Brain write
  - When there are several groups with different problems.
  - Write the problem on a sheet of paper.
  - Groups rotate and contribute with ideas.
  - No criticism.

# Variation: Concept Map

- **Concept mapping** is a technique for visualizing the relationships among different concepts.
  - Diagram showing the relationships among concepts
  - Concepts are connected with labeled arrows or lines
  - Concept maps are used to stimulate the generation of ideas, and are believed to aid creativity.

# Examples



# Exercise: Concept Map

- Do a concept map on either Dani's or Rafael's problem. You may also bring up your own problem.
  - Draw circles for the concepts
  - Labeled lines for the relationships

# Questions?

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