

## Generating Solutions

"Nothing is more dangerous than an idea, when it is the only one you have."

## Generating Solutions

- Once you have defined the problem you want to make sure you generate the best solution.
- Perseverance is perhaps the most notable characteristic of successful problem solvers, so you shouldn't become discouraged when solutions aren't immediately evident.
- Many times mental blocks hinder your progress toward a solution.
- What is the nature of these mental blocks and what causes them?

## Common Causes of Mental Blocks

- Defining the problem too narrowly.
- Attacking the symptoms and not the real problem.
- Assuming there is only one right answer.
- Getting "hooked" on the first solution that comes to mind.
- Getting "hooked" on a solution that almost works (but really doesn't).

## Common Causes of Mental Blocks

- Distracted by irrelevant information, called "mental dazzle."
- Getting frustrated by lack of success.
- Being too anxious to finish.
- Defining the problem ambiguously.

## Break up Mental Blocks

- There is a direct correlation between the time people spend "playing" with a problem and the diversity of the solutions generated.
- Draw four or fewer straight lines (without lifting your pencil from the paper) that will cross through all nine dots.

## Break up Mental Blocks

- Several creative solutions to the nine dot problem exist:
  - Roll up the piece of paper such that it is cylindrical in shape and then draw one line around the cylinder that passes through all nine dots
  - photoreduce the nine dots and then using a thick felt pen to connect them with a single line
  - Crumple up the piece of paper and stab it with a pencil (this is a statistical approach that may require more than one attempt to hit all the dots)



## What did we learn?

- The purpose of this exercise is to show that putting too many constraints (either consciously or unconsciously) on the problem statement narrows the range of possible solutions.



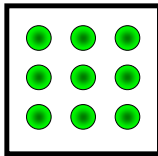
## What did we learn?

- A novice problem solvers will not cross a perceived imaginary limit--a constraint that is formed unconsciously in the mind of the problem solver--even though it is not part of the problem statement.



## What did we learn?

- Whenever you are faced with a problem, recall the nine dots to remind yourself to challenge the constraints.



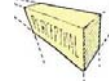
## Group Problem

- Suggest or devise 25 ways to cross a lake of molasses



## Recognizing Mental Blocks


- The first step to becoming a better problem solver is to understand what conceptual blocks are and how they interfere with problem solving.
- A conceptual block is a mental wall that prevents the problem solver from correctly perceiving a problem or conceiving its solution.
- The most frequently occurring conceptual blocks are perceptual blocks, emotional blocks, cultural blocks, environmental blocks, intellectual blocks, and expressive blocks.



## Perceptual Blocks

- Obstacles that prevent the problem solver from clearly perceiving either the problem itself or the information needed to solve it.
    - Stereotyping**
    - Limiting the problem unnecessarily** - recall the nine dot problem
    - Saturation or information overload** - Too much information can be nearly as big a problem as not enough information
- Air traffic controllers have learned to overcome this block

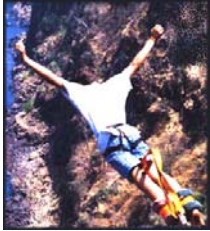





## Emotional Blocks

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- They decrease the amount of freedom with which you explore and manipulate ideas and prevent you from communicating your ideas to others.
- **Fear of risk taking** - Implementing a creative idea is like taking a risk. You take the risk of making a mistake, looking foolish, losing your job, or in a student's case, getting an unacceptable grade.
- **Lack of appetite for chaos** - Problem solvers must learn to live with confusion. What may be best for the individual may not be best for the organization or group.

## Emotional Blocks

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- They decrease the amount of freedom with which you explore and manipulate ideas and prevent you from communicating your ideas to others.
- **Judging rather than generating ideas** - This block can stem from approaching the problem with a negative attitude. Wild ideas can sometimes trigger feasible ideas which lead to innovative solutions
- **Lack of challenge** - You feel that the problem is not worthy of your efforts
- **Inability to incubate** - Rushing to solve the problem just to get it off your mind can create blocks





## Cultural Blocks

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- Acquired by exposure to a given set of cultural patterns









## Environmental Blocks

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- Distractions can create inhibit deep prolonged concentration








## Intellectual Blocks

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- Inflexible and inadequate problem-solving strategies (lacking the necessary intellectual skills)









## Expressive Blocks

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- Inability to communicate your ideas to others, in either verbal or written form




## Blockbusting

Block	Blockbuster
Negative Attitude	Attitude Adjustment
Fear of Failure	Risk Taking
Following the Rules	Breaking the Rules
Over Reliance on Logic	Internal Creative Climate
You Aren't Creative	Creative Beliefs


## Improving Your Creative Abilities

- Keep track of your ideas
- Pose new question to yourself everyday
- Keep up in your field of study
- Avoid rigid, set patterns of doing things
- Be open and receptive to new ideas
- Be alert in your observations





## Improving Your Creative Abilities

- Adopt a risk taking attitude
- Keep your sense of humor
- Engage in creative hobbies
- Have courage and self-confidence
- Learn to know and understand yourself



## Brainstorming

- Brainstorming, one of the oldest techniques to stimulate creativity, is a familiar and effective technique for generating solutions.
- Effective tool not only for one or two individuals discussing a problem in an informal setting but also in more formal large-group problem-solving sessions.






## Brainstorming

- The initial stages of idea generation begin with an unstructured free association of ideas to solve the problem (brainstorming).
- During this activity, lists of all possible solutions are generated either in group discussions or individually. The lists should include wild solutions or unusual solutions without regard to their feasibility.
- A critical component of group brainstorming is to maintain a positive group attitude. No negative comments or judgments are allowed during this stage of the solution process
- Reserve evaluation and judgment until later

## Comments That Reduce Brainstorming to Braindrizzling

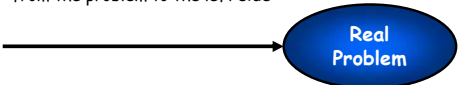

- That won't work
- It's against our policy
- That's too radical
- We don't have enough time
- It's not our job
- That's too expensive
- We can't solve this problem
- That's not practical





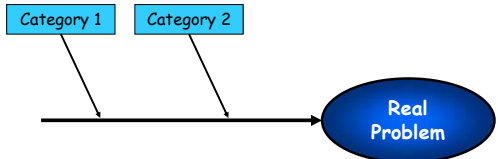

## The Fishbone Diagram

- Fishbone diagrams are a graphical way to organize and record brainstorming ideas. The diagrams look like a fish skeleton.
- To construct a fishbone diagram the following procedure is used:
  - Write the real problem in a box (or circle) to the right of the diagram. Draw a horizontal line (the backbone) extending from the problem to the left side:

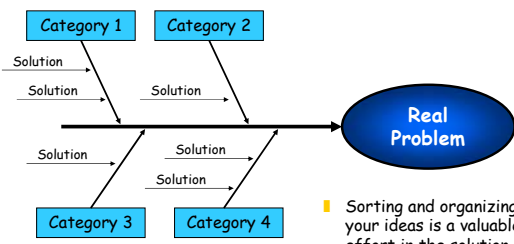
## The Fishbone Diagram

- Brainstorm potential solutions to the problem
- Categorize the potential solutions into several major categories and list them along the bottom or top of the diagram. Extend diagonal lines from the major categories to the backbone. These lines form the basic skeleton of the fishbone diagram:





## The Fishbone Diagram

- Place the potential solutions related to each of the major categories along the appropriate line (or bone) in the diagram





- Sorting and organizing your ideas is a valuable effort in the solution process





## Group Problem

- Problem Statement: How could the rules of basketball be changed so that players under 5'9" tall might be more competitive?**
- Take five minutes to generate some ideas

## Group Problem

- Lower the height of the basket.
- Taller players are not allowed outside the key.
- Platform tennis shoes.
- Tall players can guard only tall players.
- Tall players can't rebound.
- Tall players must use a heavier ball.
- Tall players can't jump.





## Osborn's Checklist

- A technique used to generate additional ideas related to those already defined

### Osborn's Checklist for Adding New Ideas

<b>Adapt?</b>	How can this idea be used as is? What are other uses it could be adapted to?
<b>Modify?</b>	Change the meaning, material, color, shape, odor, etc.?
<b>Magnify?</b>	Add new ingredient? Make longer, stronger, thicker, higher, etc.?



## Osborn's Checklist

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### Osborn's Checklist for Adding New Ideas

<b>Minify?</b>	Split up? Take something out? Make lighter, lower, shorter, etc
<b>Substitute?</b>	Who else, where else, or what else? Other ingredient, material, or approach?
<b>Rearrange?</b>	Interchange parts? Other patterns, layouts? Transpose cause and effect? Change positives to negatives?
<b>Combine?</b>	Combine parts, units, ideas? Blend? Compromise?

## Consider the basketball example

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<b>Adapt?</b>	Smaller players can foul as many times as they want (rule adaptation). Assists by smaller players count as points.
<b>Modify?</b>	Raise baskets for taller players (modify court). Tall players stay inside 3-point line
<b>Magnify?</b>	Short player's baskets worth 4-points (magnify score).
<b>Minify?</b>	Tall player's shots worth 1-point (minify score).
<b>Rearrange?</b>	Separate leagues for taller and shorter players (rearrange grouping).



## Random Stimulation


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- Random Stimulation** is a technique which is especially useful if we are stuck or in a rut. It is a way of generating totally different ideas than previously considered and can "jump start" the idea generation process and get it out of whatever current rut it may be in.
- Introduce "*weird*" ideas during brainstorming.
- Choose randomly a word from the dictionary. Use that word to generate other words that can simulate the flow of ideas.

## Other People's Views (OPV)

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- When approaching a problem that involves the thoughts and feelings of others.
- Imagining yourself in the role of the other person allows you to see complications of the problem not considered previously.



## Example of Other People's Views

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- Problem:** Space capsule burns upon entering the atmosphere
- Project Manager:** Complete the project on time
- NASA Accountant:** Solve Problem but cost low
- Engineer:** New material should not interfere with capsule
- Materials Scientist:** Find a material that can handle the high temperature on reentry.
- Astronaut:** Doesn't care about:the capsule, to return;
- Final solution:** Allow the surface of the capsule to be destroyed, protecting the astronauts.




## Group Problem

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- Problem Statement:** You are a passenger in a car without a speedometer. Describe 25 ways to determine the speed of the car.
- Take five minutes to generate some ideas








## Futuring

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- Examine the problem carefully to make sure the real problem has been defined.
- Now, imagine yourself at some point in the future after the problem has been solved. What are the benefits of having a solution?
- "Look around" in the future. Try to imagine an ideal solution to the problem at hand without regard to technical feasibility. Remember, in the future, anything is possible.
- Make statements such as: "If only (this) \_\_\_\_\_ would happen, I could solve..."
- Dare to change the rules! The best solutions to some problems are contrary to conventional wisdom.



## Group Problem

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- **Problem Statement:** What features would you like to have on a television 10 years from now?
- Take five minutes to generate some ideas
- Create a fishbone diagram for your ideas

## Brainwriting

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- Two or more individuals are required in order to carry out an interactive brainstorming session.
- However, when there is no one to interact with, a technique being used by many companies is that of brainwriting.
- In brainwriting you follow the same procedure as brainstorming (e.g., free association, Osborn's checklist, random stimulation, futuring). Write down your ideas as fast as you generate them, never pausing or stopping to evaluate the idea.
- Keep a notebook handy to write down ideas, because they often come at unusual times.

## Analogy and Cross-fertilization

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- It is well documented that a number of the most important advances in science, engineering, art, and business come from cross-fertilization and analogies with other disciplines.
- Here ideas, rules, laws, facts, and conventions from one discipline are transferred to another discipline.
- There are four steps you can use to solve problems by analogy:
  - 1) State the problem,
  - 2) Generate analogies (this problem is like trying to...),
  - 3) Solve the analogy, and
  - 4) Transfer the solution to the problem.







## Analogy and Cross-fertilization

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Consider the following pairs:

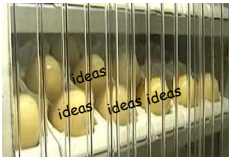
- A beautician and a college professor.
- A policeman and a software programmer.
- An mechanic and an insurance salesman.
- A banker and a gardener.
- A choreographer and an air traffic controller.
- A maitre d' and a pastor.






## Incubating Ideas

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- The incubation period is very important in problem solving. Working on a solution to a problem to meet a deadline often causes you to pick the first solution that comes to mind and then "run with it," instead of stopping to think of alternative solutions.
- Communicate with other people.
- Ask questions about all the circumstances. Go home and think.
- Let it sit overnight, and think about it from time to time.
- Put the problem down and do something else for awhile






## SUMMARY

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- Be able to recognize the different mental blocks when they appear (Perceptual Emotional, Cultural, Environmental, Intellectual, and Expressive Blocks)
- Use Blockbusters: Attitude Adjustment, Risk Taking, Breaking the Rules, Internal Creative Climate, and Creative Beliefs.
- Use Osborn's Checklist to generate new ideas: Adapt, Modify, Magnify, Minify, Rearrange, Combine.
- Use Random Stimulation and Other People's Views (OPV) to generate new ideas.



## SUMMARY

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- Remove all technical blocks to envision a solution in the future.
- Use a fishbone diagram to help organize your ideas/solutions.
- Use analogy and cross-fertilization to bring ideas, phenomena, and knowledge from other disciplines to bear on your problem.
- Let the problem incubate so that your mind keeps working on it while you are doing other things.

## End of Chapter 4

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