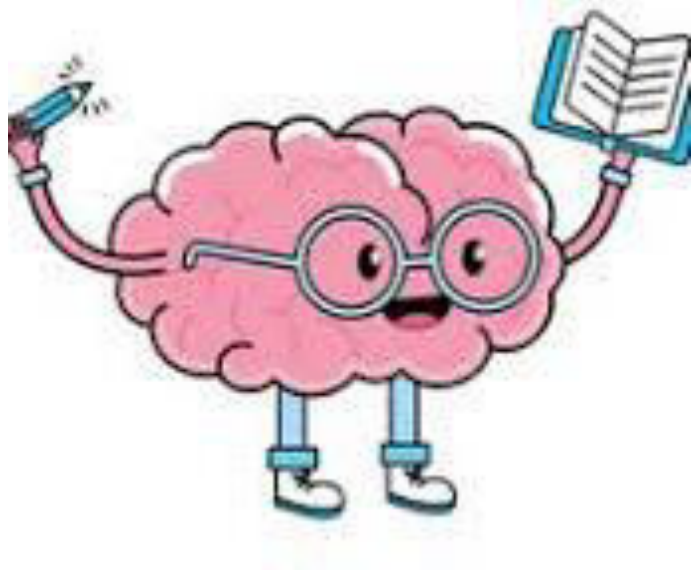
Thinking And Problem Solving



Thinking

Thinking is defined as the manipulation of mental representation of information.

Thinking transforms a particular representation of information into new and different forms in order to answer questions, solve problem or reach goals.

- ***Mental Images***

They are the mental representations in the mind of an object or event.

They are not just visual representations but our ability to “hear” a tune in our heads.

Infact, every sensory modality may produce corresponding mental images.

- ***Concepts***

Categorization of objects, events, or people that share common properties.

Concepts enable us to organize complex phenomenon into simpler and therefore more easily usable cognitive catergories.

Concepts help us classify newly encountered objects on the basis of our past experience.

Concepts effect our behavior, if we want a pet we know dog can be a pet but after classifying it as a wolf we know its not a pet because the concepts for both are different.

Prototype

Typical highly representative examples of a concept that corresponds to our mental image or best example of the concept.

Example

Although Robin, sparrow and ostrich both are example of birds but robin is more associated are exemplified as bird in western countries on the other hand in Pakistan sparrow. So, robin and sparrow are prototypes of a concept of bird in repective cultures.

Reasoning

- ***Reasoning***

It is the process by which information is used to draw conclusions and make decisions.

Types of Reasoning

Deductive reasoning

Inductive reasoning

Evaluative reasoning

- ***Deductive reasoning***

- It is also known as SYLLOGISTIC REASONING.
- It proceeds on the basis of past knowledge.
- It draws conclusion from general bits of knowledge to specific present.
- It is formal reasoning in which a person draws a conclusion from a set of assumptions.
- It follows the rules of Aristotelian logic.

i.e.

A=b and B=c

So,

A=c

- ***Inductive reasoning***

This is the essence of creative thinking both in science and art .

It leads from specific present to the more general conclusion is not totally predictable.

- ***Evaluative reasoning***

This type of reasoning is critical in nature.

It judges the correctness or suitability of an idea.

The validity of the conclusion depends both upon reasoning process and the standard use

- ***Algorithms***

A rule that if applied appropriately guarantees a solution to a problem.

- ***Heuristics***

A heuristic is cognitive short cut that may or may not lead to a solution.

Heuristics enhance the likelihood of success in coming to a solution but unlike algorithms they cannot ensure it.

It can be said to as a strategy that may or may not pay off.

- ***Types Of Heuristics***
- Hill climbing
- Sub Goals
- Representativeness Heuristic
- Availability Heuristic

Hill Climbing:

Problem-solving strategy in which each step moves you progressively closer to the final goal.

Sub Goal:

Intermediate, more manageable goals used in a heuristic strategy to make it easier to reach the final goal

Representativeness Heuristic

A rule we apply when we judge people by the degree to which they represent a certain category or group of people.

Example

A person owner of a fast food chain being robbed by teenagers few times is more likely to raise guard when a teenager enters the restaurant.

- ***Availability Heuristic***

Judging the probability of an event on the basis of how easily the event can be recalled from memory.

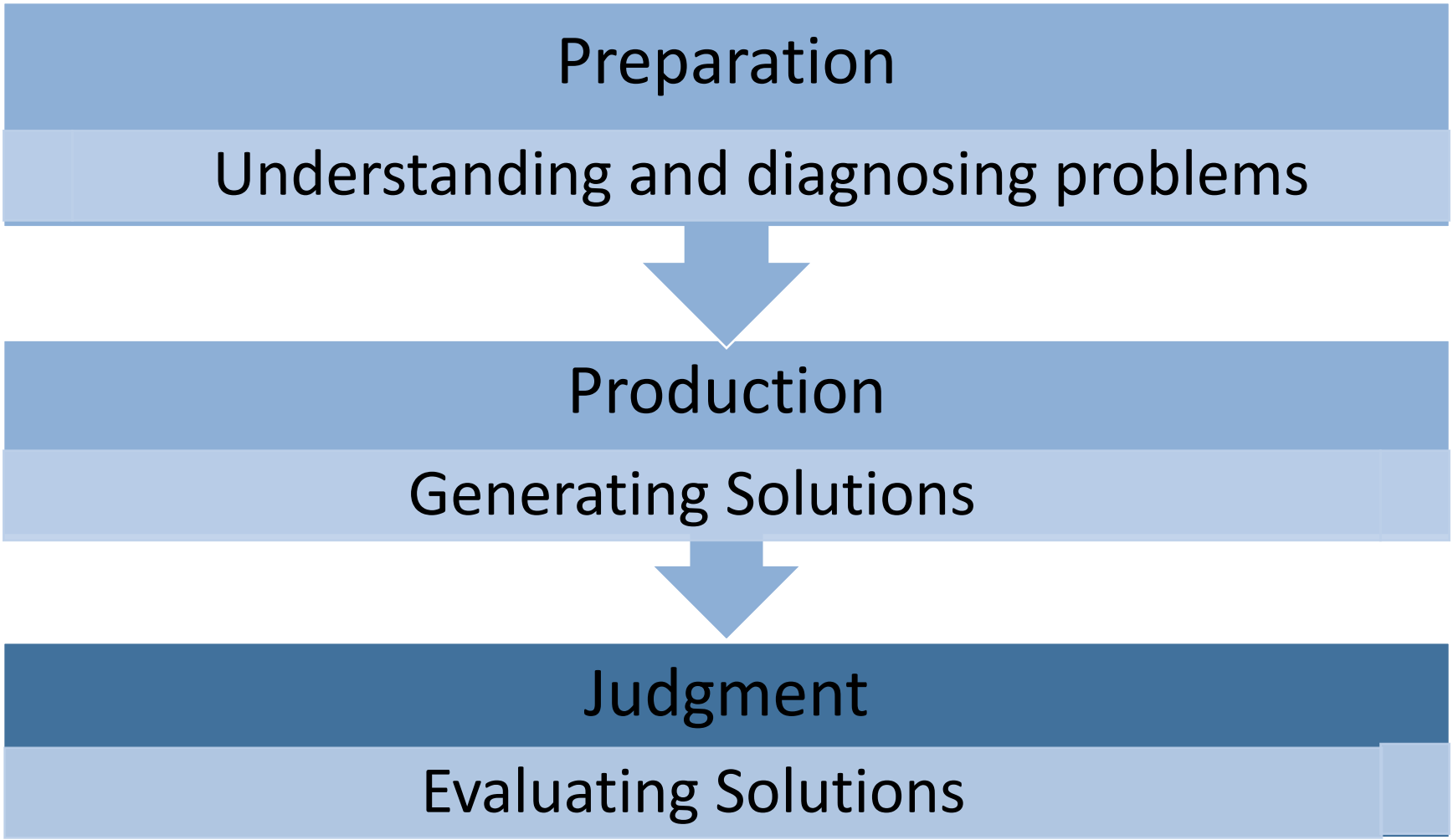
According to this heuristic we assume that events we remember easily are likely to occur in future then events that are harder or difficult to remember.

Problem Solving

Problem solving is said to as reaching to a conclusion by passing through several mental processes.

Psychologists have found that problem solving typically involves 3 steps

- Preparation
- Production
- Judgment

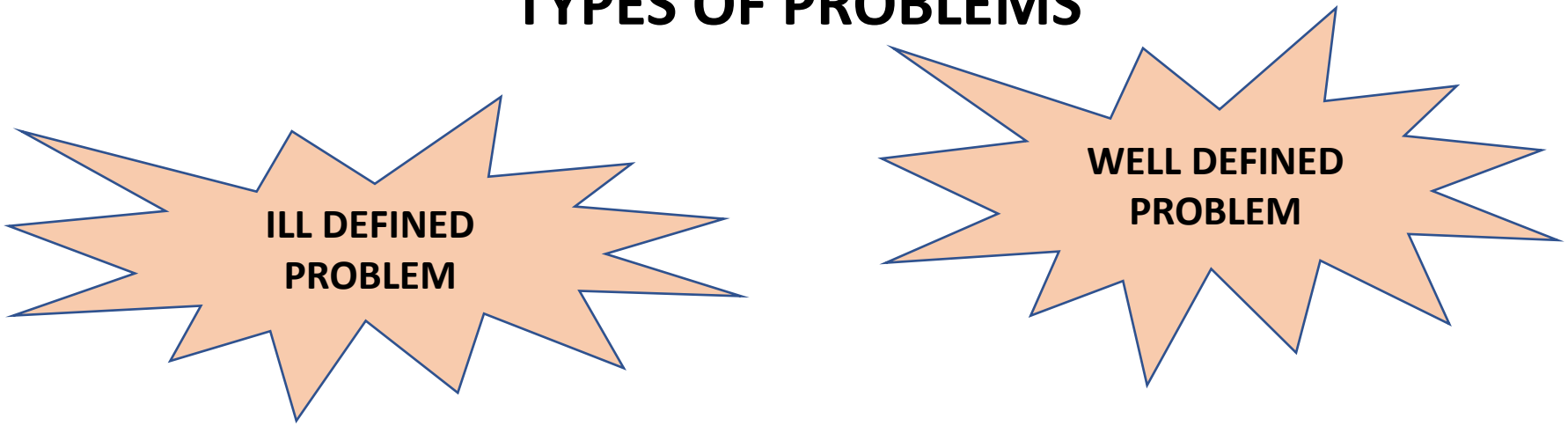

Preparation
Understanding and diagnosing problems
Production
Generating Solutions
Judgment
Evaluating Solutions

Preparation

❖ **Defining Problem**

- It refers to understanding of the problem i.e. defining the problem.
- If the problem is novel, it will take time to understand the problem.
- If the problem is not novel, less time would be spent on understanding it.

TYPES OF PROBLEMS



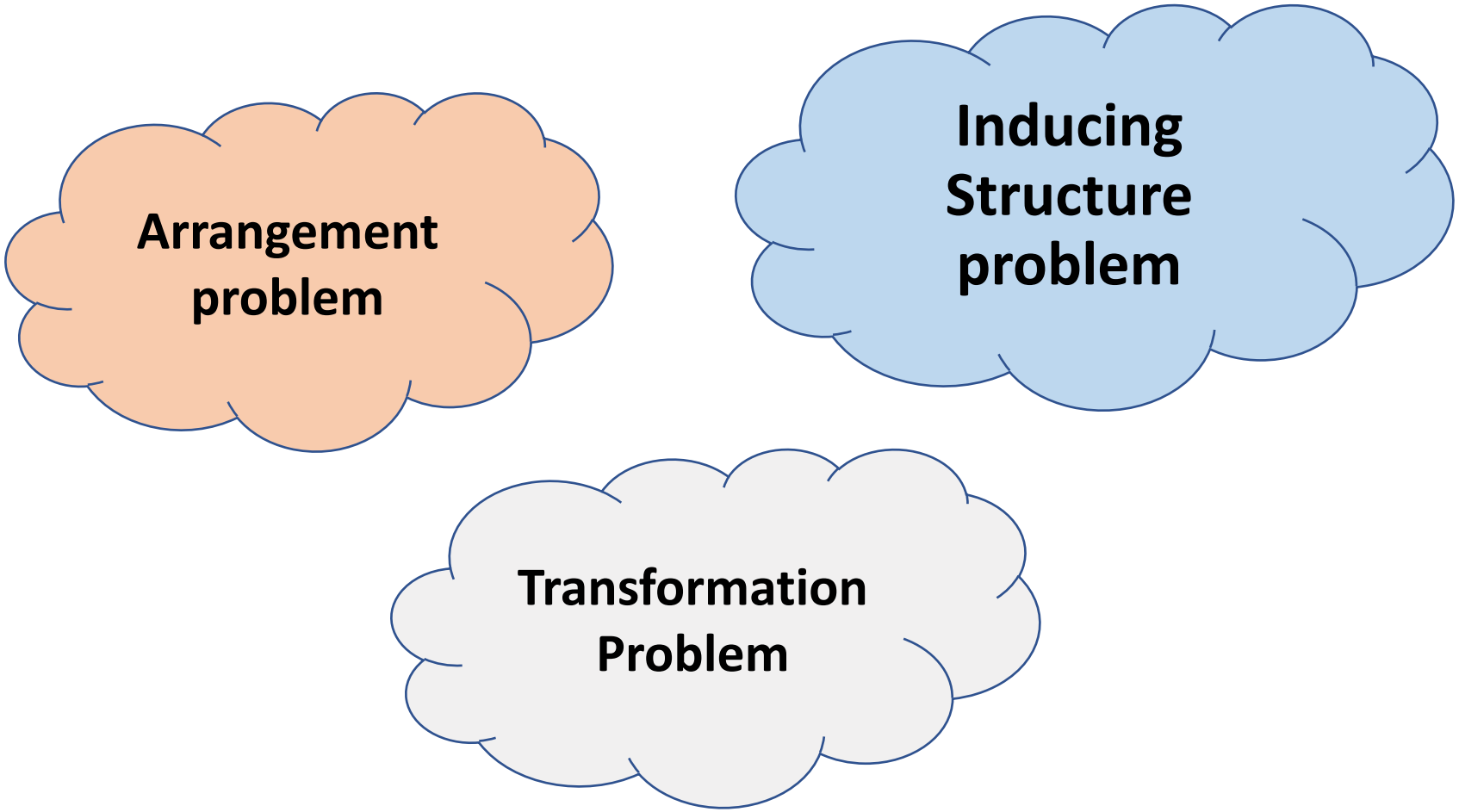
Well Defined Problem

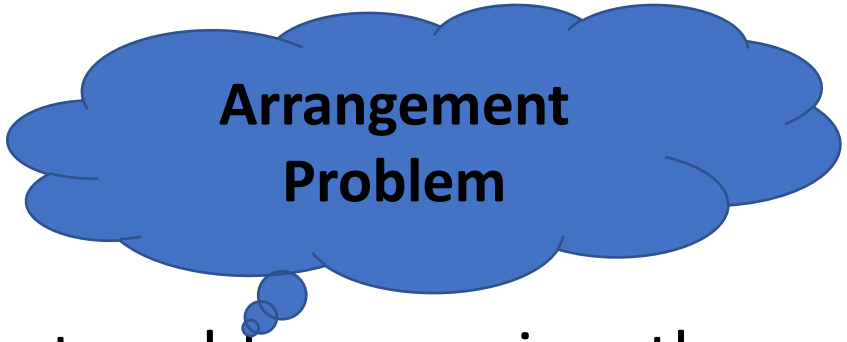
In this type of problem nature of the problem and solution both are clear.

Ill Defined Problem

In this type of problem the specific nature of the problem is unclear, and the information required to solve problem may be less obvious.

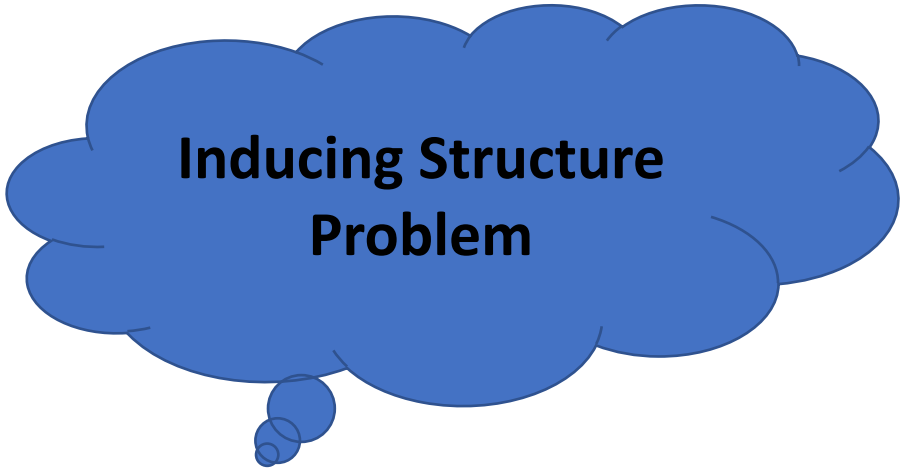
Types Of Well-Defined Problem





- Arrangement problem requires the problem solver to rearrange or recombine elements in a way that will satisfy a certain criterion.

- Different arrangements can be made, only one or few will produce a solution.



- In this problem the solver need to identify the existing relationship between the elements presented and then construct a new relationship among them.
- Example

14-24-34-44-54-64 ___

Now to solve this problem one needs to identify the relation between the elements i.e. the fist digit is increasing by one while the second remains constant, so the next number would be 74.

Transformation Problem

- In this type of problem one is presented with the initial state, a goal state and the method of arranging the initial state into goal state.

How can the person measure exactly 11 ounces

- Simple solution is that Fill jar A empty it into jar B once and in jar C twice the what remains in the jar is 11 ounces.

❖**Organizing and arranging the problem**

It is how we organize and present the problem for ourselves.

Production

❖ **Generating Solution**

- After defining and organizing a problem next step is to generate as many ideas as possible.

- If the problem is simple we get direct answers from our long term memory directly.

- In this phase one can generate solutions by trail and error method and for complex problems use cognitive shortcuts i.e. heuristics.

- The most commonly used heuristic in this phase is ***means end analysis.***

- ***Means end analysis*** it is the repeated testing for differences between the desired outcome and what currently exists.

- Means-ends analysis sometimes results in moving too far away from the end goal.

- One heuristic strategy that helps to prevent this is **working backward** from the desired goal to the given conditions.

❖ **Forming sub Goals**

- This is also a form of heuristic in which the problem is subdivided into parts or sub goals.
- To divide problem into sub goals requires a proper strategy.
- By solving the sub goals eventually the problem can be solved.

❖ **Insight**

It is a sudden awareness of the relationships among various elements that have previously appeared to be independent of one another.

Judgment

❖**Evaluating the solution**

- The final stage of problem solving is judging the adequacy of a solution.
- If the solution is less concrete or if there is no single correct solution evaluating solutions becomes more difficult.

IMPEDIMENTS TO SOLUTIONS

➢Functional Fixedness

➢Mental set

- **Functional Fixedness**

The tendency to think of an object only in terms of its typical use.

- **Mental Set**

The tendency for old patterns of problem solving to persist.

❖ **Inaccurate evaluation of solution**

Sometimes we are not able to evaluate the solutions properly because of ***confirmation bias.***

Confirmation Bias

The tendency to favor information that supports one's initial hypothesis and ignore contradictory information that supports the alternative hypothesis.

Problem Solving (IDEAL)

John Branford and Berry Stain introduced the IDEAL method, a very basic type of method, for solving a problem

I = Identify your problem.

D = Define, specify and present your problem.

E = Explore possible strategies.

A = Act on the explored strategies and plans.

L = Look back and evaluate the results

Explaining Our Decisions

Two common ways of explaining decisions are:

Hindsight bias - the tendency to see outcomes as inevitable and predictable after we know the outcome.

Counterfactual thinking - thinking about alternative realities and things that never happened.

Creativity And Problem Solving

- Despite obstacles to problem solving many people adequately discover creative solution to the problems.

What is creativity?

The ability to generate original ideas or solve problem in novel ways.

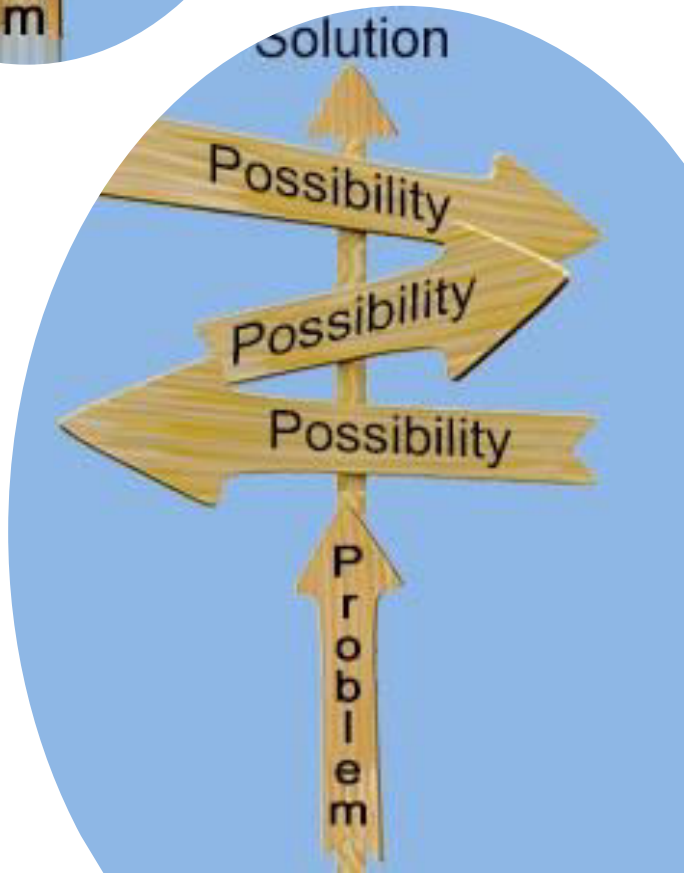
Types of Creative Thinking

Divergent thinking

Convergent thinking

- **Convergent Thinking**

The ability to produce responses that are based primarily on knowledge and logic.

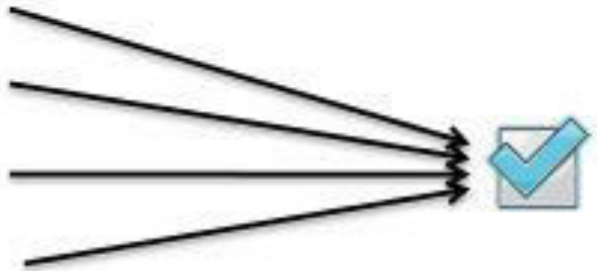


- **Divergent Thinking**

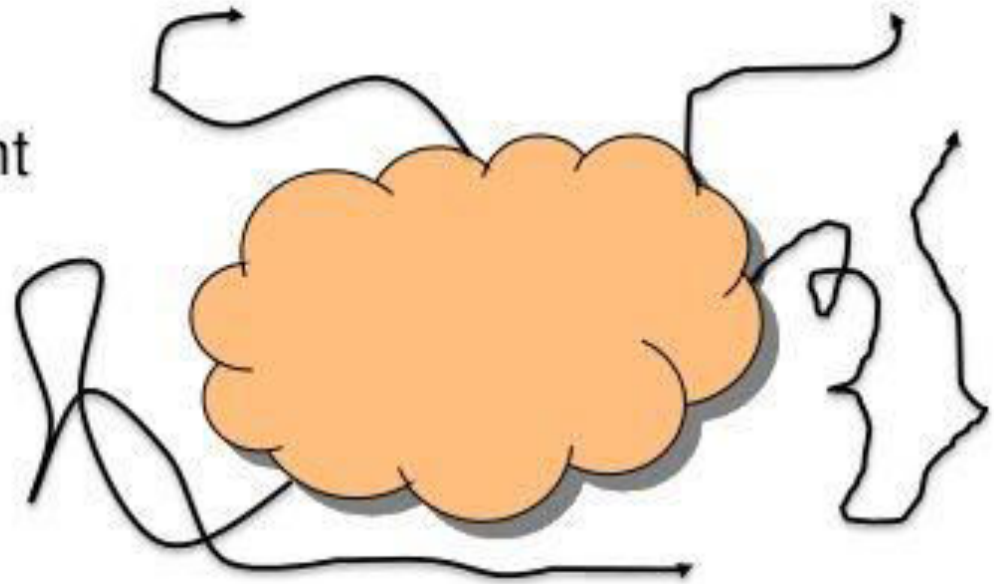
The ability to generate unusual nonetheless appropriate responses to problems or questions.

Our Brains work in two ways

- Convergent Thinking (left brain)
  - Logical
  - Analytical
  - Solution reducing



- Divergent Thinking (right brain)
  - Creative
  - Artistic
  - Solution generating



DE BONO'S THINKING HATS

Yellow — BENEFITS
Positives
Advantages
Improvements
Benefits
Optimism
What are the good points?
Why is this one preferable?
How can we make this work?

Black — PROBLEMS
Weak points
Negatives
Downsides
Bad bits
Pessimism
What is wrong with this?
What do we used to be careful of?

Blue — PLANNING
Working out
Analysis
Organisation
Reasoning
Thinking
What thinking is needed?
What is our planning?
What's the next step?
How can we summarise it?

Green — IDEAS
Solutions
Recommendations
Proposals
Possibilities
Alternatives
What are our suggestions?
Are there any other ideas?
Are there any alternatives?
Could we do this a different way?

Red — EMOTIONS
Feelings
Guesses
Hunches
Gut reactions
How do we feel about it?
What are our hunches?

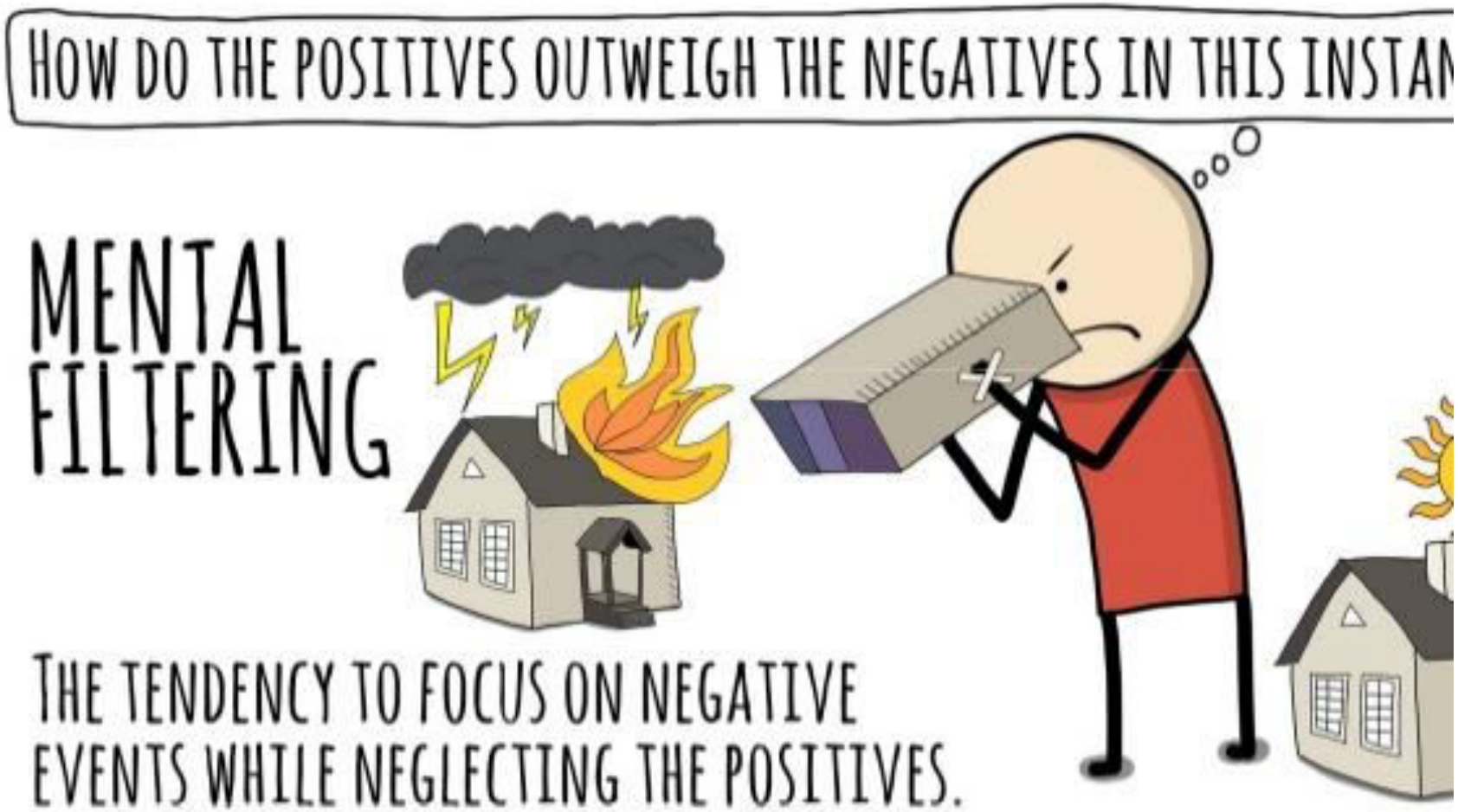
White — FACTS
Figures
Informations
Details
Proof
What information do we have?
What information do we need?
What information is missing?
How are we going to get the information we need?

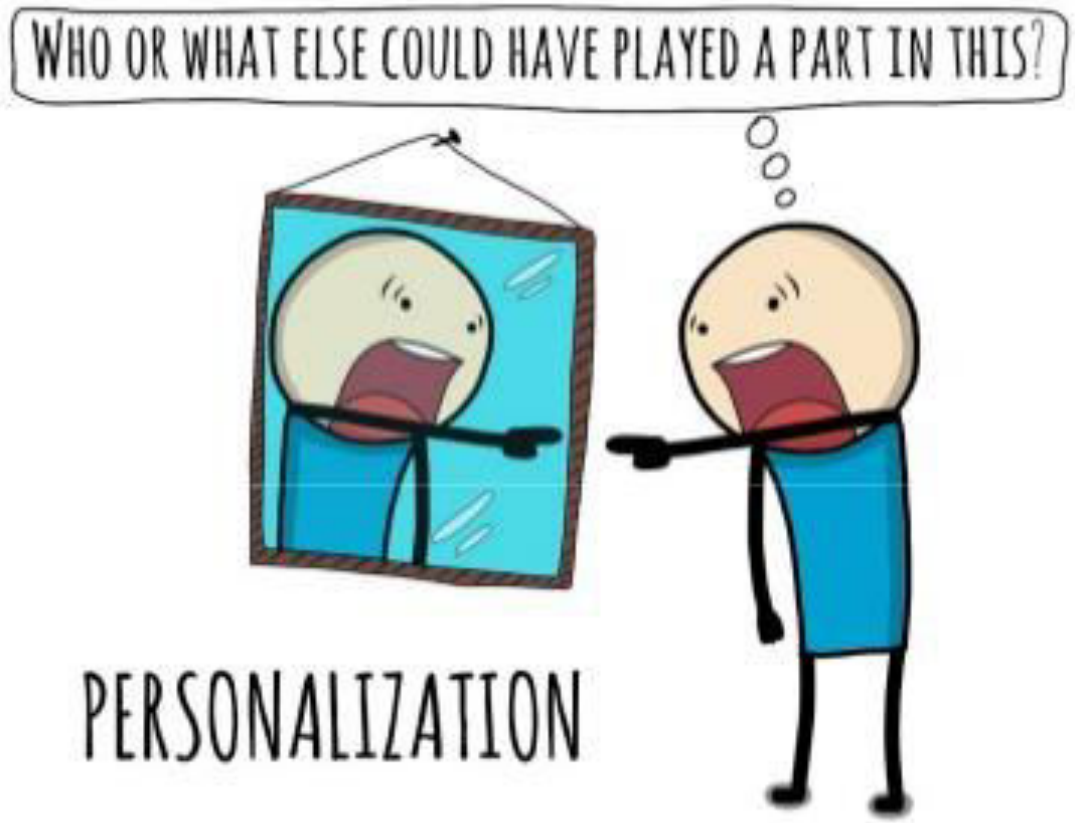
- De Bono's Thinking Hats: a system designed by Edward de Bono which describes a tool for group discussion and individual thinking involving six colored hats.

- "Six Thinking Hats" and the associated idea parallel thinking provide a means for groups to plan thinking processes in a detailed and cohesive way, and in doing so to think together more effectively.

Five Errors

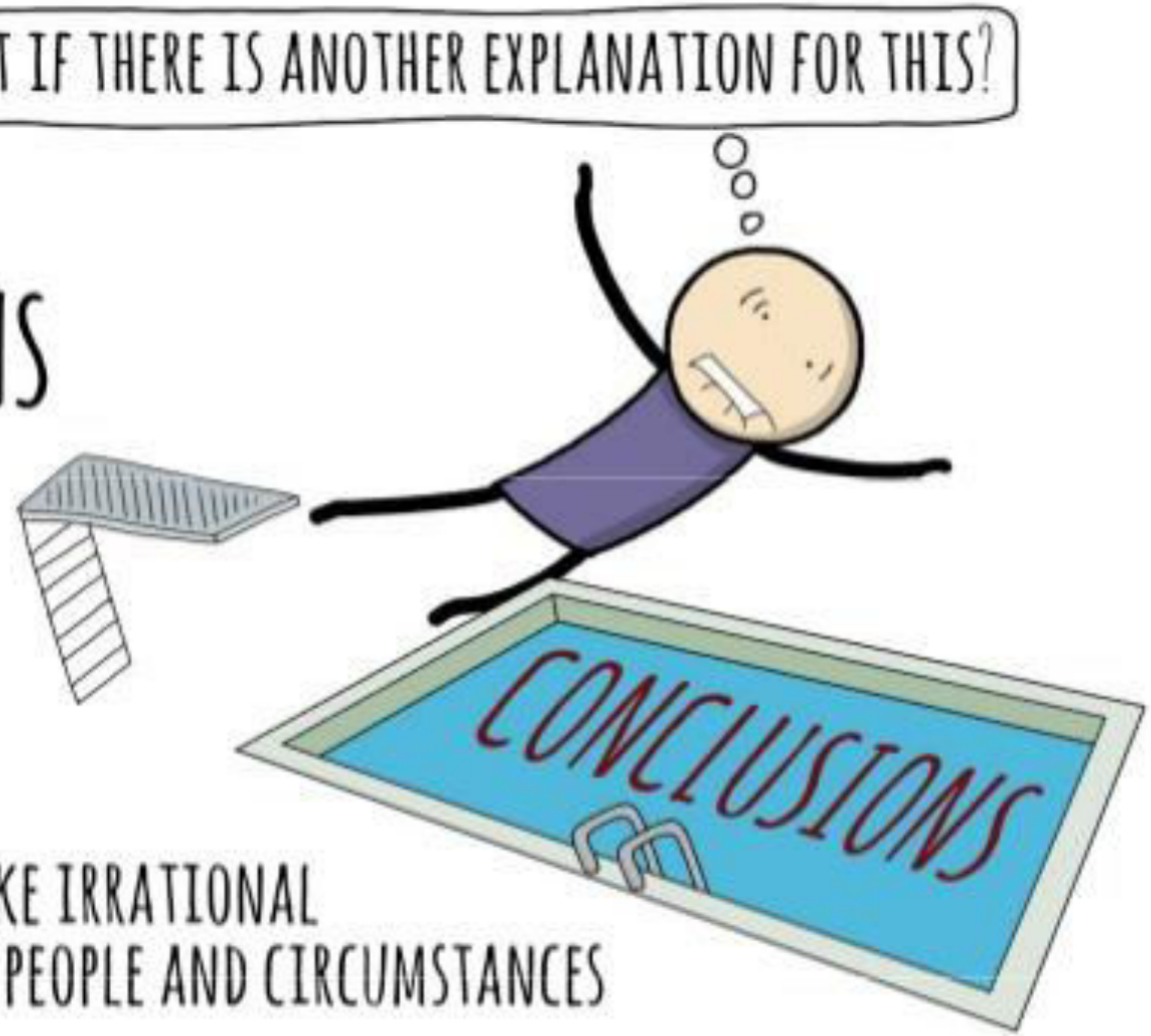
Unhelpful Thinking Styles


HOW DO THE POSITIVES OUTWEIGH THE NEGATIVES IN THIS INSTAN
MENTAL FILTERING
THE TENDENCY TO FOCUS ON NEGATIVE EVENTS WHILE NEGLECTING THE POSITIVES.

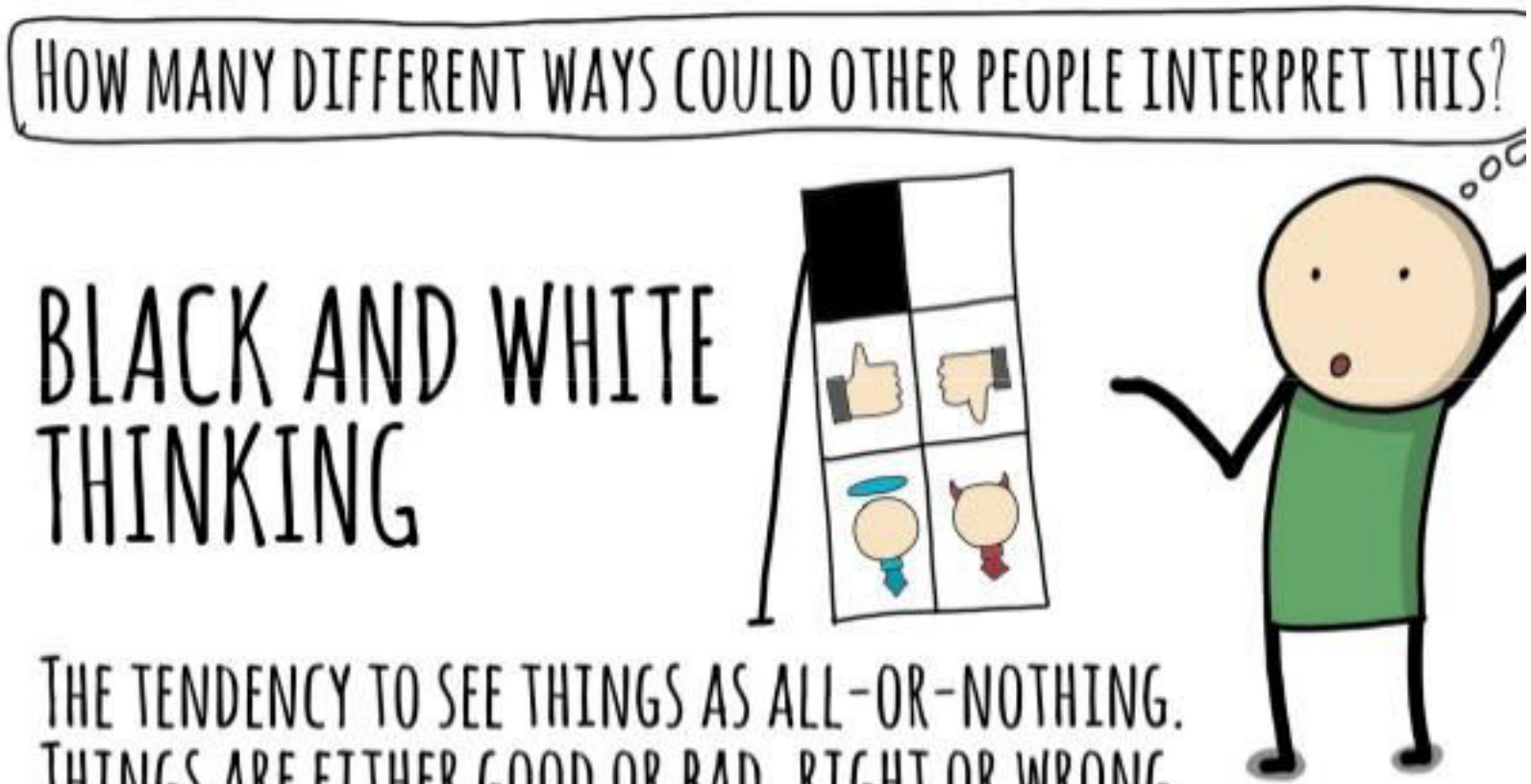


THE TENDENCY TO TAKE THE BLAME FOR
ABSOLUTELY EVERYTHING THAT GOES WRONG IN YOUR LIFE.

JUMPING TO CONCLUSIONS



THE TENDENCY TO MAKE IRRATIONAL ASSUMPTIONS ABOUT PEOPLE AND CIRCUMSTANCES


HOW MANY DIFFERENT WAYS COULD OTHER PEOPLE INTERPRET THIS?
BLACK AND WHITE THINKING
THE TENDENCY TO SEE THINGS AS ALL-OR-NOTHING.
THINGS ARE EITHER GOOD OR BAD, RIGHT OR WRONG.

THE TENDENCY TO BLOW CIRCUMSTANCES OUT OF PROPORTION BY MAKING PROBLEMS LARGER THAN LIFE.

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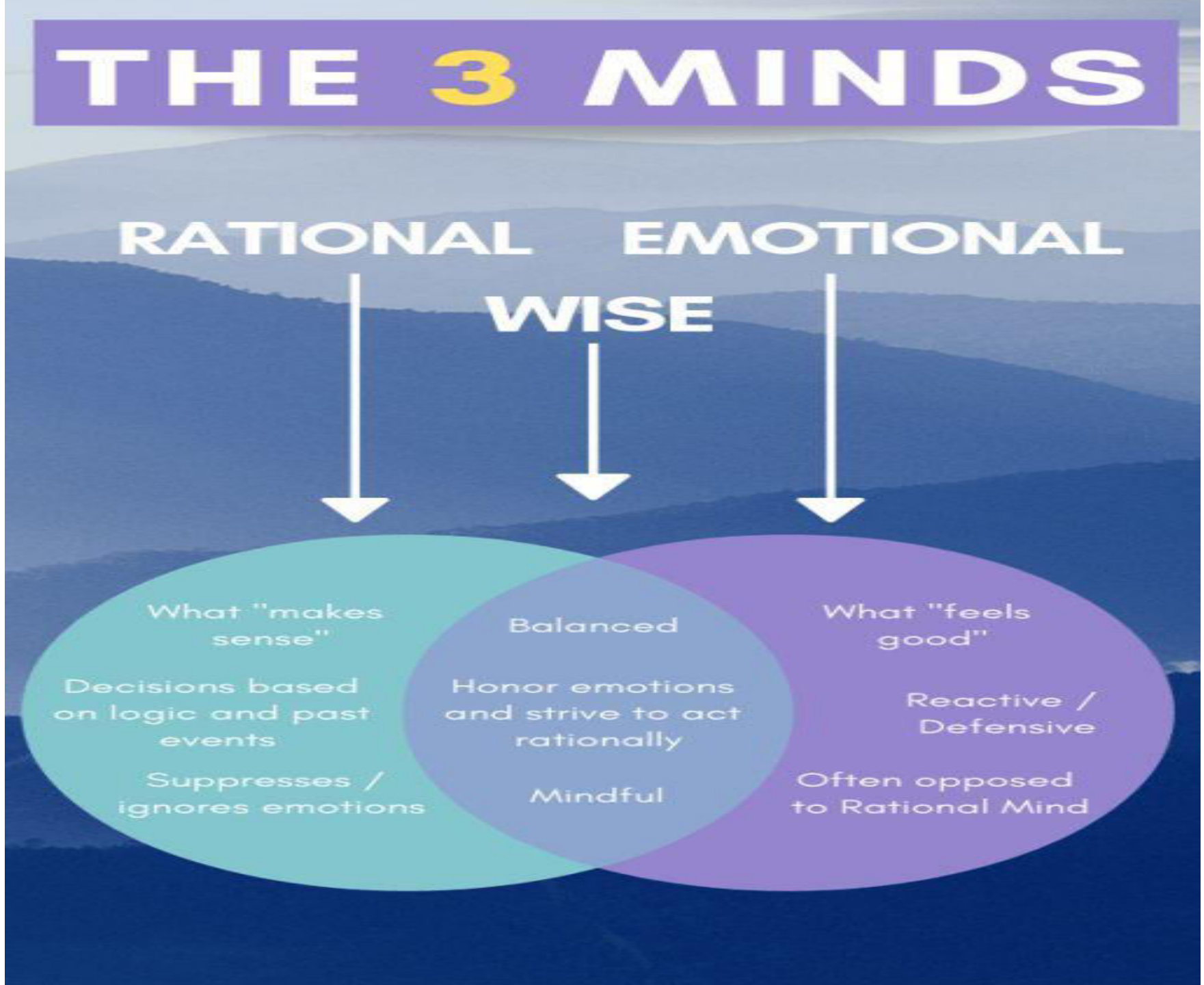
THE 3 MINDS
RATIONAL
EMOTIONAL
WISE
What "makes sense"
Decisions based on logic and past events
Suppresses / ignores emotions
Balanced
Honor emotions and strive to act rationally
Mindful
What "feels good"
Reactive / Defensive
Often opposed to Rational Mind