SCIN 101
Creative Thinking and Innovation

Handout

Why should we think?

- Preparation of coming events
- Problem-solving
- Improvements (life, job, sports)
- Understanding the world and reality (objectivity)

What is thinking?

Wikipedia

Thought encompasses an "aim-oriented flow of ideas and associations that can lead to a reality-oriented conclusion". Although thinking is an activity of an existential value for humans, there is still no consensus as to how it is adequately defined or understood.

Other definition

Thinking is most conscious and inherent activity of the mind to reach understanding of reality and being able to modify it.

Active/Passive Thinking

Stressituation: Impaired thinking capacity in stress situations passive thinking = Thoughts the classic: Missing an Event. Early plane to catch! Slept too long.
Active thinking: preparation, coordination of future events problem solving

What part of the brain deals with thinking
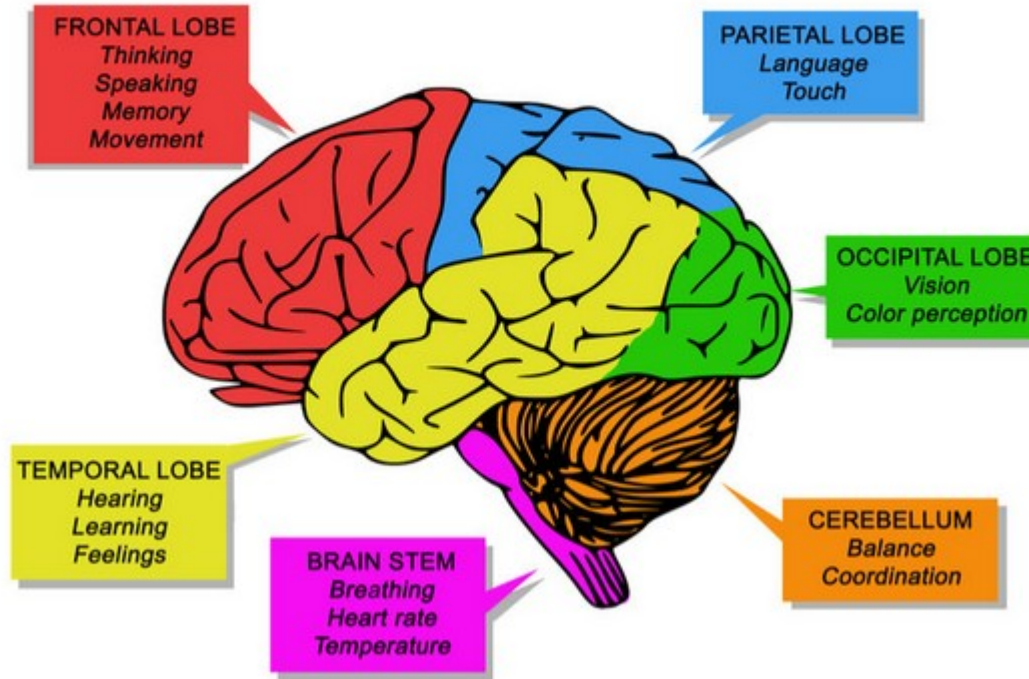
Thinking experiments

Thinking is associated/driven by condensed or extended speech

1. **How would you learn to make bread.**

The best&most efficient way to learn would be through A baker,
the internet, your friend or trial and error.

2. **How to make bread; Describe your thinking experience**

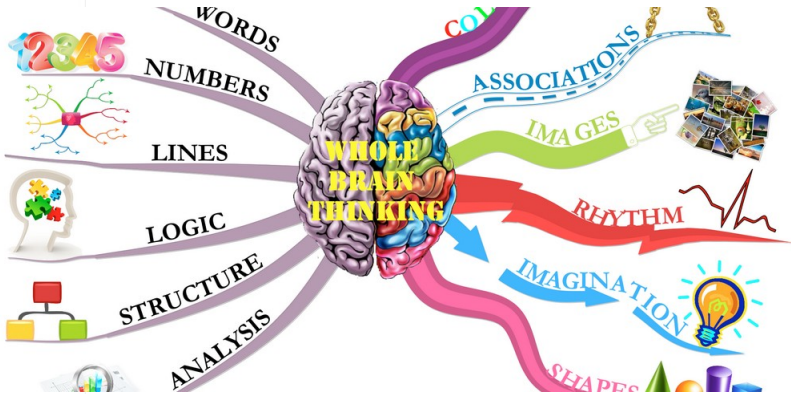3. **Think aloud test: How would you make a bread!**
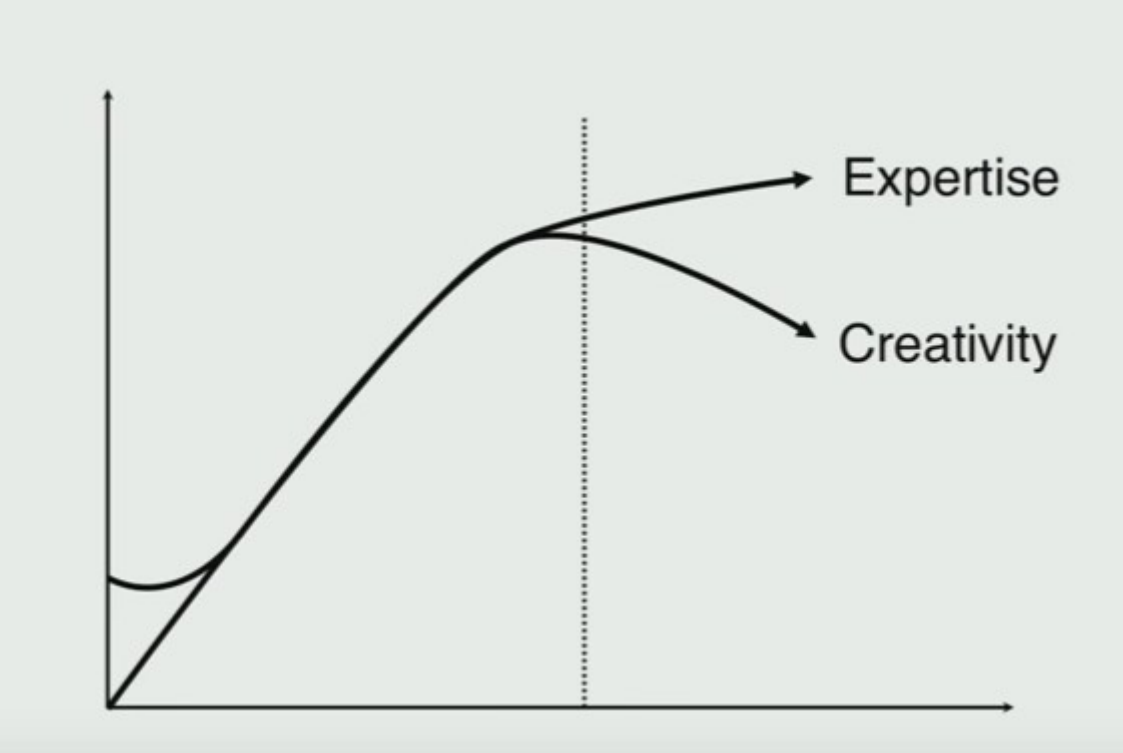
What is creative thinking? Non-logics

Levels of creativity

- Art
- Problem-solving
- Improvements (life, job, sports)

Blocks of creativity
- Fear of change
- Following rules
- Unaware of self-empowerment

Thinking, Language and Creativity

- Perception (Russian language color experiment)

- Spatial thinking (Kuuk Thaayorre experiment)

- Temporal thinking
  - Language writing = spatial (card experiment)
  - vertical/horizontal thinker
  - amount/length thinker

- Grammatical Gender

Learning a new language = learning a new way of thinking = becoming more creative

What is Creativity?

"Creativity is a combinatorial force: it's our ability to tap into our 'inner' pool of resources – knowledge, insight, information, inspiration and all the fragments populating our minds – that we've accumulated over the years just by being present and alive and awake to the world and to combine them in extraordinary new ways." — Maria Popova, Brainpickings

Imaginative → Creative

Creativity is the act of turning new and imaginative ideas into reality. Creativity is characterised by the ability to perceive the world in new ways, to find hidden patterns, to make connections between seemingly unrelated phenomena, and to generate solutions. Creativity involves two processes: thinking, then producing.

Practicing Creativity

- Circumstantial
  - Awareness of Negative thinking (breaking the negative triad of self, the world, and future)
  - Language
  - Behavior own and imposed (rules in life?)
  - Life style (social, hobbies, nutrition etc)
- Practice
  - Randomness and Associating excerice (**Creativeness is the ability to see relationships where none exist**)
  - Questioning (challenging common wisdom)
  - Observing(scrutiny)
  - Networking (meeting people with other ideas and perspectives)
  - Experimenting (Black box tests → unknown mechanism, unknown outcome)
  - Insights during sleep
  - Dissolution of left and right brain activity by physical exercise
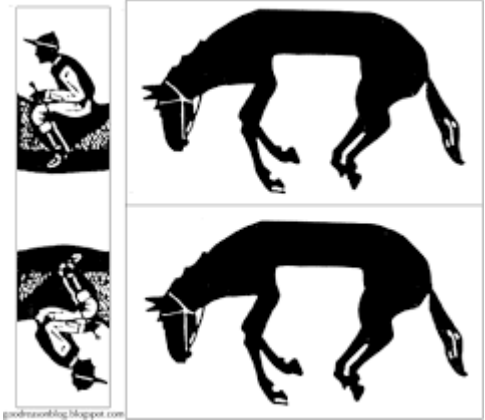
Identification of rules!
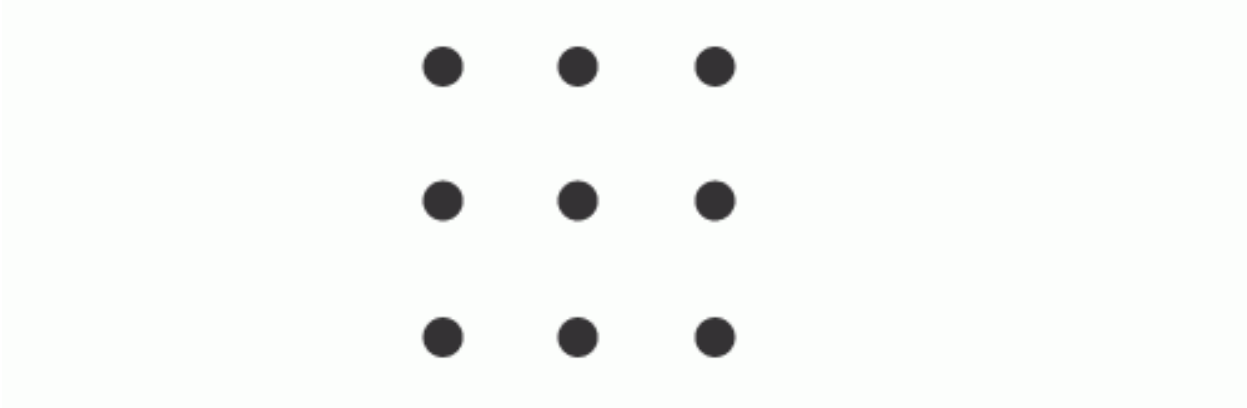

What is the next shape in this sequence?

Credited to Wujec, Tom (1995), *Five Star Mind, Games & Puzzles to Stimulate Your Creativity & Imagination*, Doubleday, New York.

Breaking self-imposed rules

Each jockey rides one horse!

Link all 9 dots using four straight lines or fewer without lifting the pen and without tracing the same line more than once

Innovation and Invention

NOVELTY

Invention → patenting
Creative product → commercialization
Innovation → new market
Scientific knowledge → new knowledge

Novelty Quality

- can be easily outdated or overturned
- finding is not difficult, based on routine
- anybody in the field could do it with given time and budget

	Novelty	Entity	Usefulness	Stage of development
Invention	(I) absolute spatial/Temporal novelty: Invention never reported in history by any provable means (ii) high quality of novelty:difficult to get the idea for exerts in the field	Limited to apparatus, methods, compounds, structures	(I) possible relevance for market (ii) significant improvement when compared with state of the art	Maximal until Prototype Not neccessarily in use by anybody
Innovation	(I) temporal or spatial novelty not necessarily required/often underlying technical or methological novelty (e.g. invention/process)	Anything including patentable inventions	(I) accepted relevance for the market or creating new market (ii) improvent not related to state of the art	From prototype to product Used by entities of the market

Disruptive Innovation

What is the difference between disruptive and revolutionary innovation?

Creative Thinking and Innovation Practical Training -Case Study

Steps from problem to innovation

STep	Action	Task	Thinking and Result
1	Identification of Problem in detail	Technical literature review	Critical thinking for taking action
2	Analysis of the problem	State of the art analysis	Analytical thinking for directing action
3	Brain storming for solutions	Knowledge based and random idea collection	Creative thinking for seeking solutions
4	Evaluation of ideas	Idea selection	Critical, analytical, creative thinking for reassurance of solution
5	Development of the idea	Experimentation	Analytical thinking/invention/creative product for initiation of the process
6	Prototyping	Prove of concept study	Analytical/Creative thinking for realization of the solution
7	External validation	Application in the field	Analytical thinking for interfacing with market
8	Marketing	Application in the field commercial	Analytical, creative thinking for influencing the market

Understanding problem-solving, creativity and innovation

- Plastic garbage world wide → Do we have a problem?

- How to solve the problem?

Creativity → Innovation

Creativity → behavioral change