بسم الله الرحمن الرحیم

در مسیر کارآفرینی دانش بنیان

جلسه ی ششم:

خلاقیت و حل خلاقانه ی مسائل

رضا لطفی
استاد گروه مهندسی برق دانشگاه فردوسی مشهد
و رییس بنیاد نخبگان خراسان رضوی

۱۱ مرداد ۱۴۰۰


إِنَّ اللَّـهَ لَا يُغَيِّرُ مَا بِقَوْمٍ حَتَّىٰ يُغَيِّرُوا مَا بِأَنفُسِهِمْ
سوره رعد
خدا حال هیچ قومی را دگرگون نخواهد کرد
تا زمانی که خود آن قوم حالشان را تغییر دهند

هدف از برگزاری این نشست ها

- هم می توانیم و هم باید «بیشتر» ارزش آفرین باشیم.
- مهمترین ضعف ما در این مسیر، عدم آشنایی کافی ما با «طرز فکر کارآفرین» و «مسیر کارآفرینی دانش بنیان» هست.

- تغییر چیزی نیست که همراه با یک چک لیست بیاید. در دنیایی زندگی می کنیم که بادها و دریا دائما در حال تغییر هستند و گنج دو بار در یک مکان پنهان نمی شود. در عوض، آنچه ما در اختیار داریم، یک قطب نما است.
- وظیفه ی ما ایجاد طرز فکر، فرهنگ و روابطی است تا انسانهای داخل سیستممان به گونه ای توانمند شوند که بخواهند و بتوانند که بادبانها را در هر شرایط آب و هوایی در جهت جدید و صحیح تنظیم کنند.

از مقدمه ی ناشر در کتاب
The Innovator's Mindset

سرفصل مطالب این هشت جلسه ان شاء الله

1. طرز فکر و طرز فکر رشد
2. نوآفرینی و طرز فکر نوآفرینی
3. Design thinking
4. از ایده شروع کنیم یا از مساله؟ چه مسائلی ارزش حل کردن دارند؟
5. بوم کسب و کار و بوم نوآفرینی
6. خلاقیت و حل خلاقانه ی مسائل
7. ویژگی های یک تیم خوب / هنر جذب سرمایه
8. فرهنگ کار / آنچه در دانشگاه نمی آموزیم

Top 10 skills

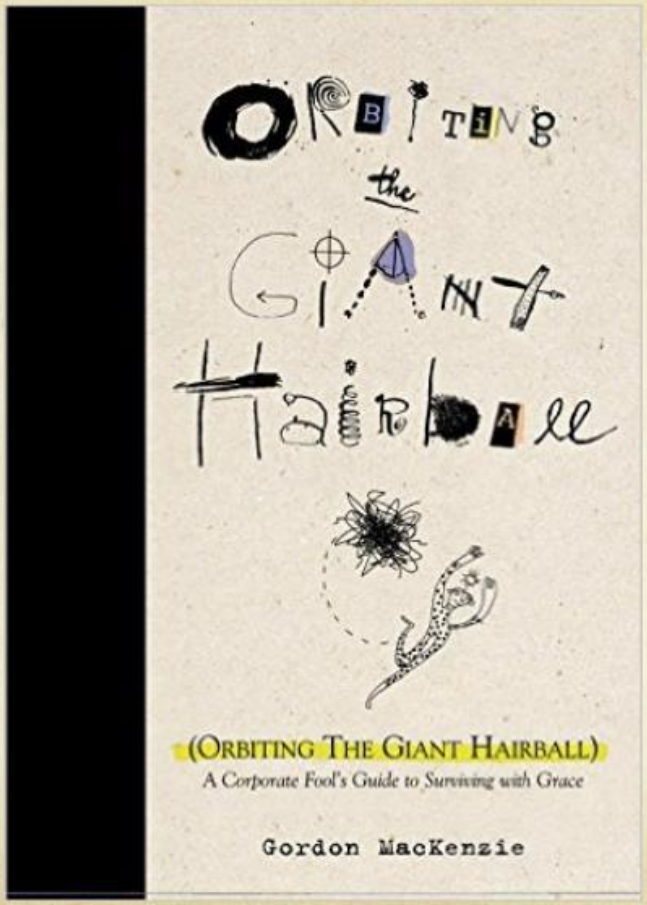
in 2020	in 2015
1. Complex Problem Solving	1. Complex Problem Solving
2. Critical Thinking	2. Coordinating with Others
3. Creativity	3. People Management
4. People Management	4. Critical Thinking
5. Coordinating with Others	5. Negotiation
6. Emotional Intelligence	6. Quality Control
7. Judgment and Decision Making	7. Service Orientation
8. Service Orientation	8. Judgment and Decision Making
9. Negotiation	9. Active Listening
10. Cognitive Flexibility	10. Creativity

سرفصل مطالب

- خلاقیت چیست؟
- روشهای پرورش خلاقیت
- حل خلاقانه ی مسائل
- Brainstorming
- جمع بندی

خلاقیت
Creativity

How many artists in the room?



"The higher the grade, the fewer children raised their hands... Every school I visited was participating in the suppression of creative genius".

Creativity: What, Why, and How

To create: To bring into being out of nothing

Creativity: Thinking skills that lead to create something

Creativity in Science and Engineering: A mental process involving the generation of new ideas or concepts, or new associations between existing ideas or concepts.

Creativity is one of the essential attributes we would like our graduates to have – all others are useless without creativity.

Innovation and Invention are impossible without creativity.

Steve Jobs

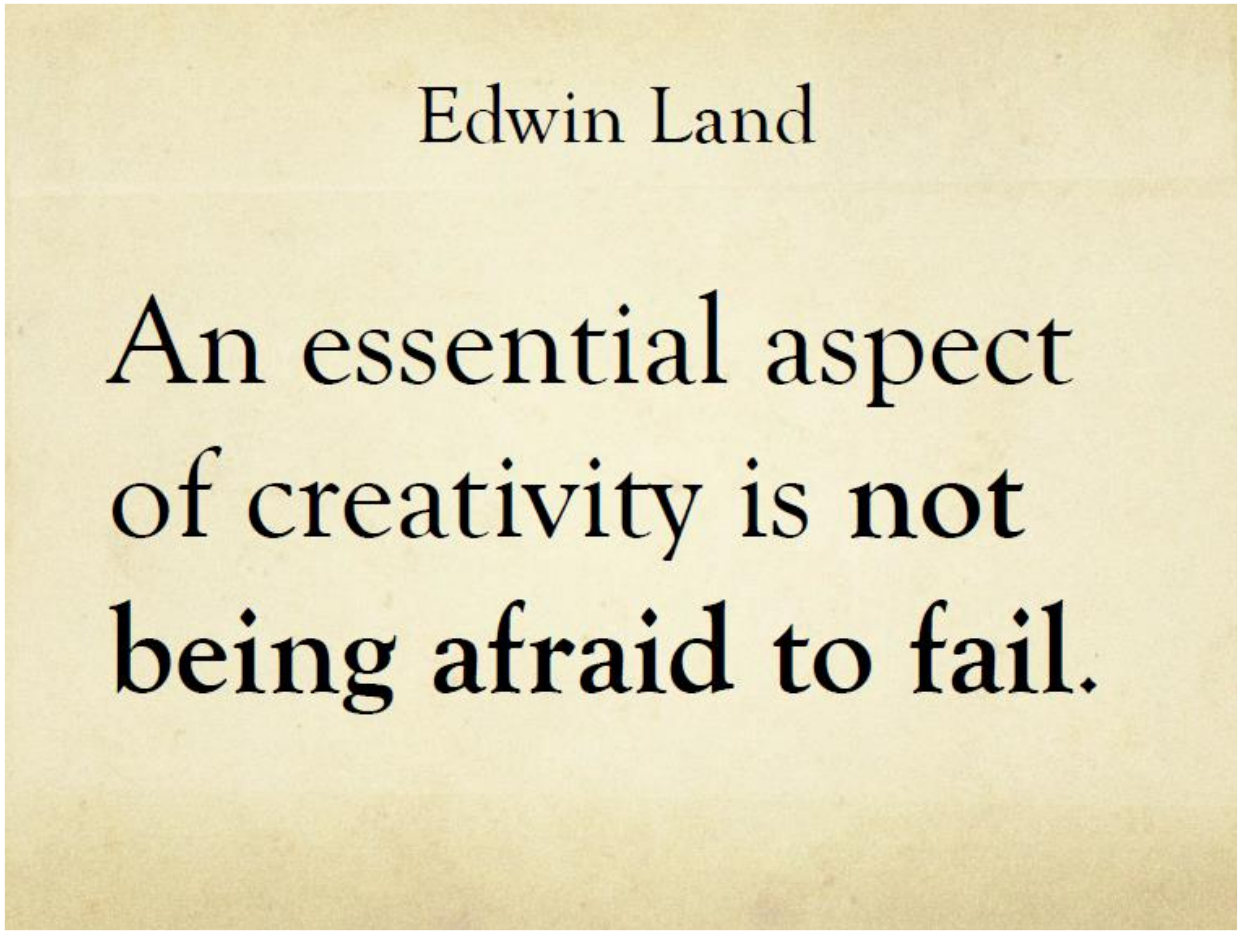
Creativity is just **connecting things**. When you ask creative people how they did something, they feel a little guilty because they didn't really do it, they just saw something. It seemed obvious to them after a while. That's because they were able to connect experiences they've had and synthesize new things.

Edward de Bono

Creativity involves breaking out of established patterns in order to **look at things in a different way.**

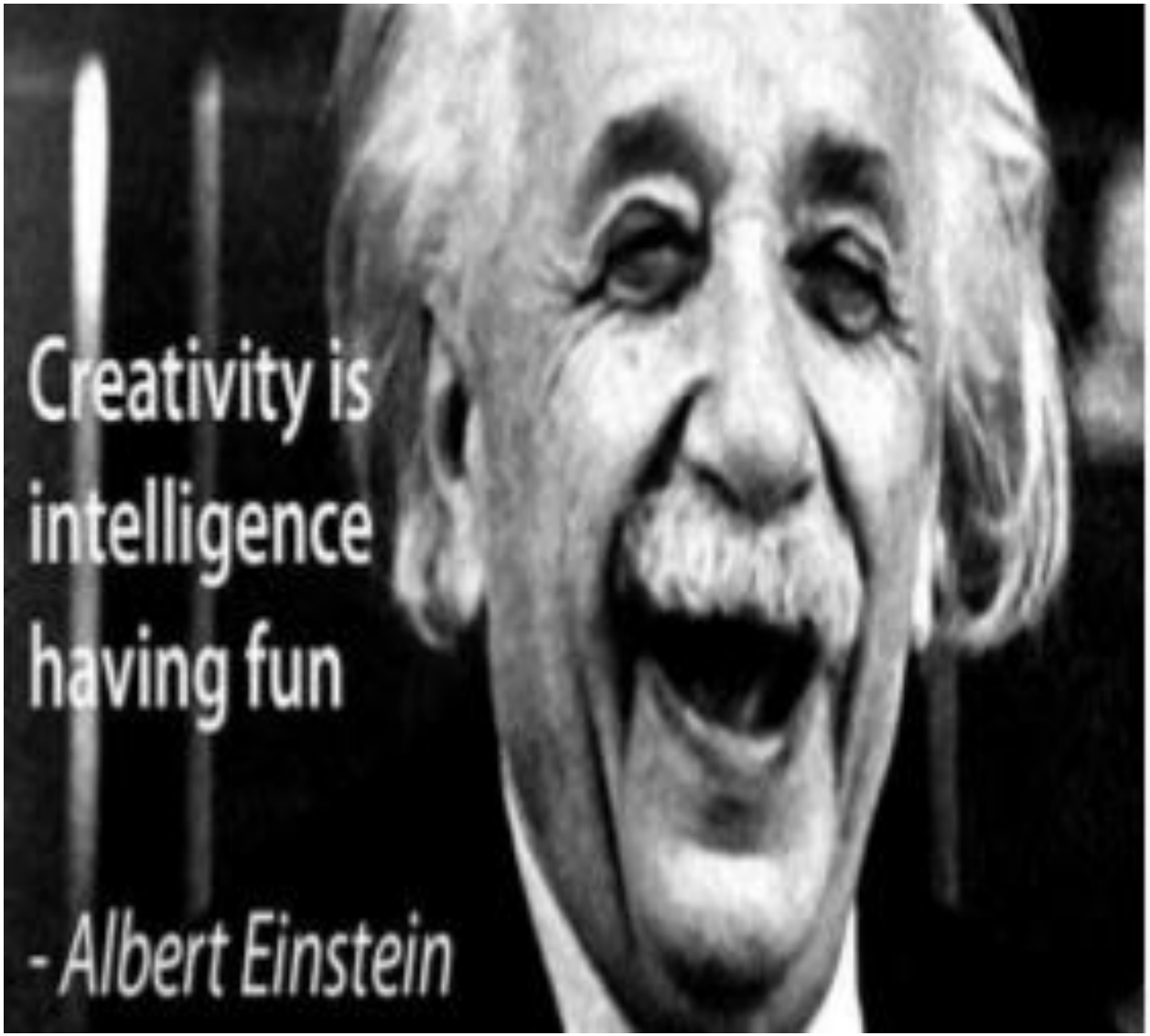
Ken Robinson

Creativity is putting your **imagination to work**, and it's produced the most extraordinary results in human culture.


Edwin Land
An essential aspect of creativity is not being afraid to fail.

Wikipedia

Creativity is a phenomenon whereby **something new** and **somehow valuable** is formed.

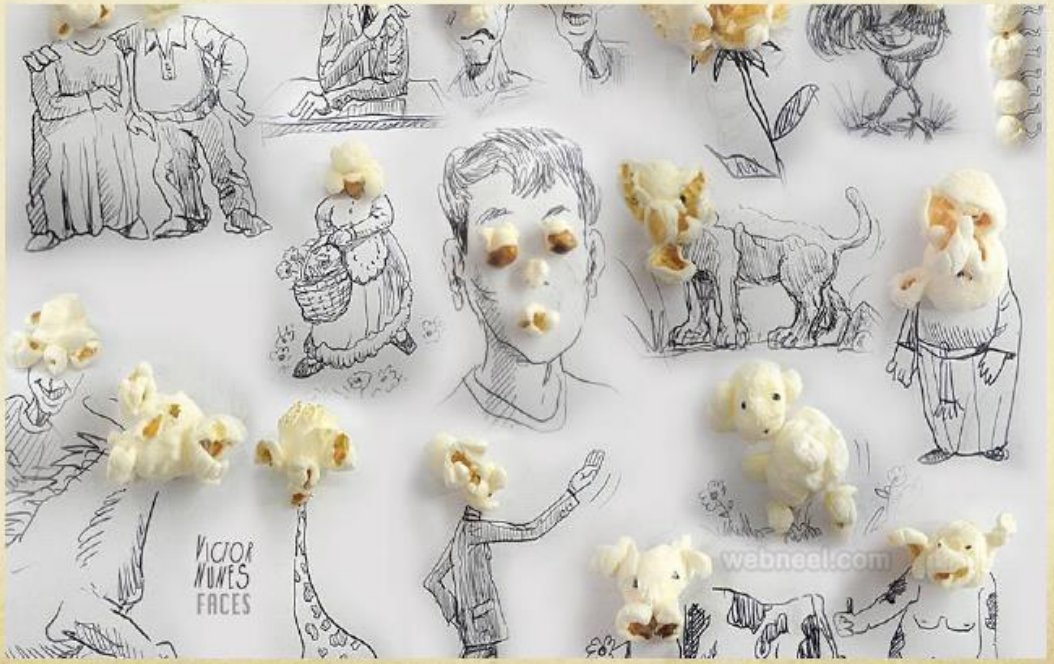

Creativity is
intelligence
having fun
- Albert Einstein

Creativity

The ability to transcend traditional ideas, rules, patterns, relationships, or the like, and to create meaningful new ideas, forms, methods, interpretations, etc.; originality, progressiveness, or imagination

http://dictionary.reference.com/

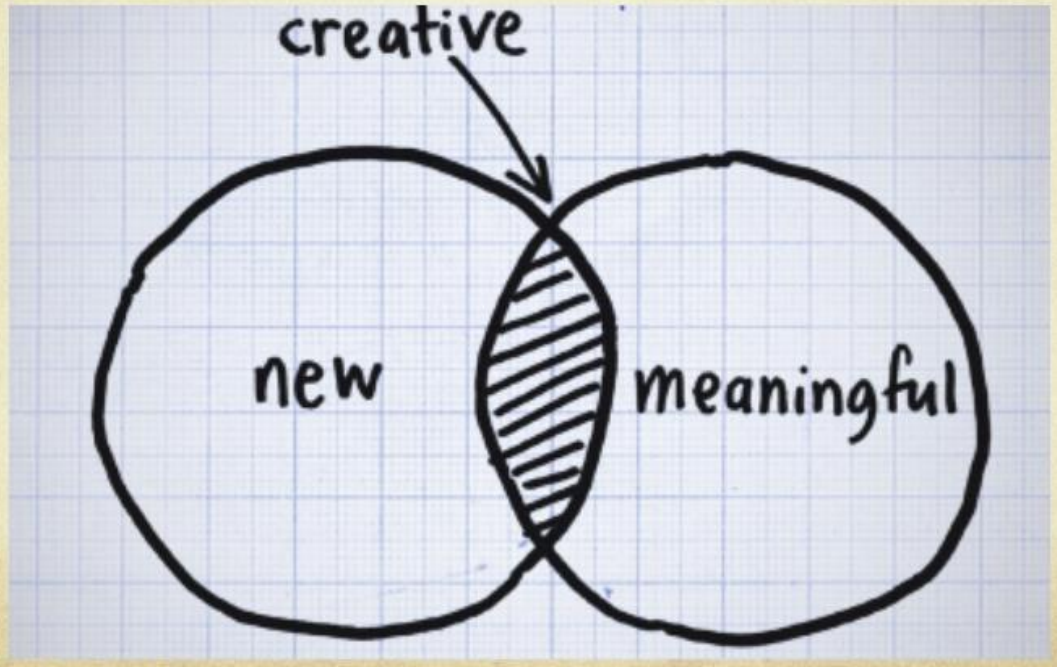
So, let's go again...we are all creative!!!



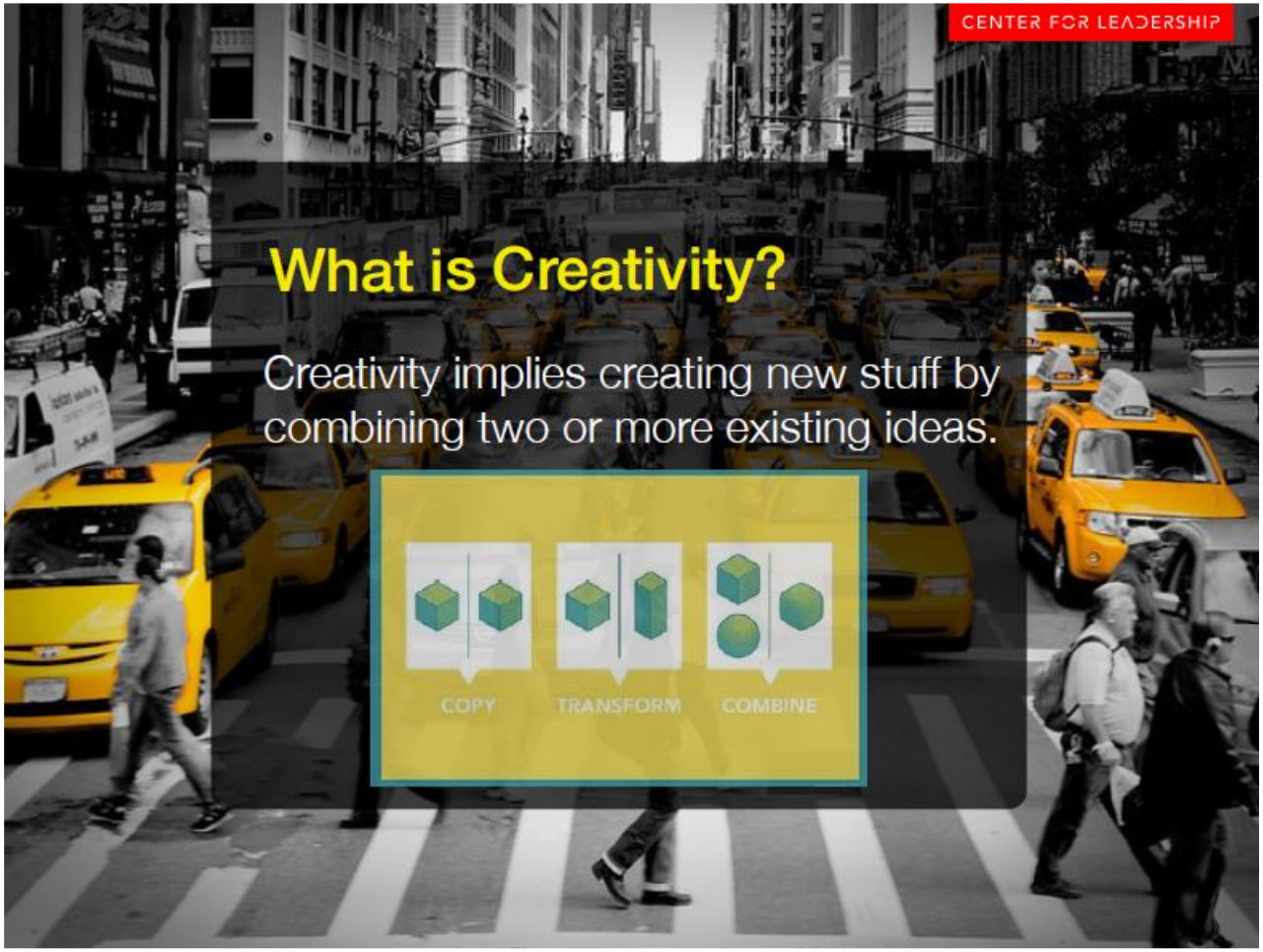
Creative or not?

Creative or not?

So, when is something "creative"?



http://vandewerk.nl/boost-creative-thinking/#more-2336


CENTER FOR LEADERSHIP
What is Creativity?
Creativity implies creating new stuff by combining two or more existing ideas.
COPY
TRANSFORM
COMBINE

Who can be creative?

Creativity is not just for artists, musicians, writers, and designers. We are all creative, but the people who are known for it have spent time cultivating it, failing at it, and working at it

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- روشهای پرورش خلاقیت
- حل خلاقانه ی مسائل
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- جمع بندی

پرورش خلاقیت
Cultivate Creativity

I don’t wanna grow up!

How can we keep our child-like creativity?

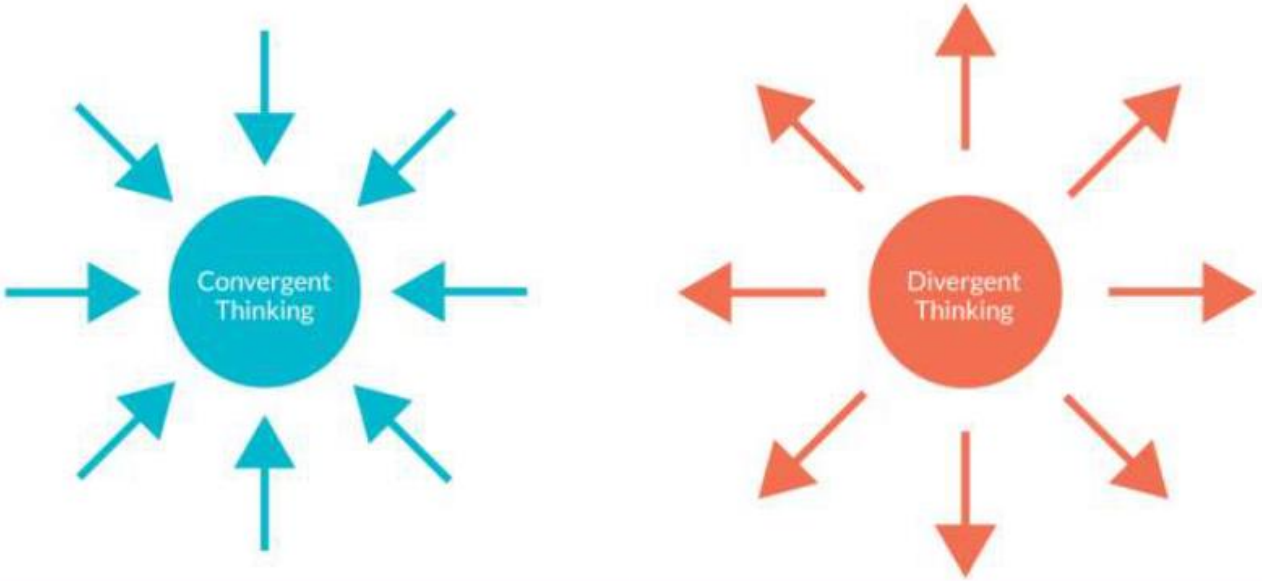
- Our ideas about our surrounding become set in stone in our early adult life
- Kids are relatively unbiased; they don’t carry around many of the pre-conceptions that adults do
- They’re generally much less afraid to be embarrassed by their ideas

What makes a good idea?

Great ideas are built out of a collection of existing parts

Life Outside The Box

Convergent vs Divergent Thinking



Convergent Thinking

1 + 1 = 2

Divergent Thinking

Spontaneous, Free-flowing, Non-linear

Have a ton of terrible ideas.

The more ideas you can think of, the better chance you'll have a good one.

Have a ton of terrible ideas.

The more ideas you can think of, the better chance you'll have a good one.

Step away and do something else.

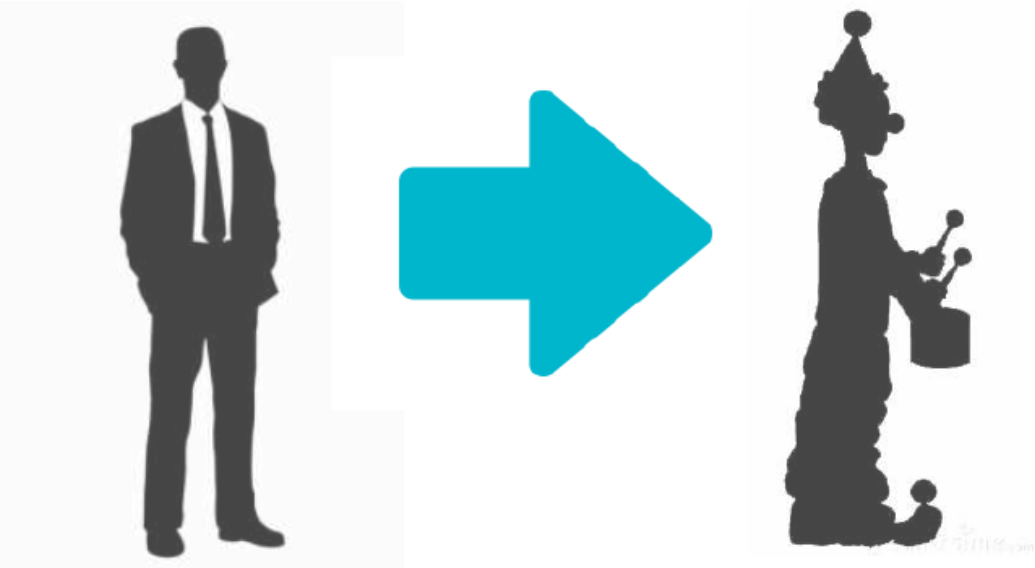
Anything else.

Listen to or watch something funny.

Laughter relaxes us.

Create a range of solutions.

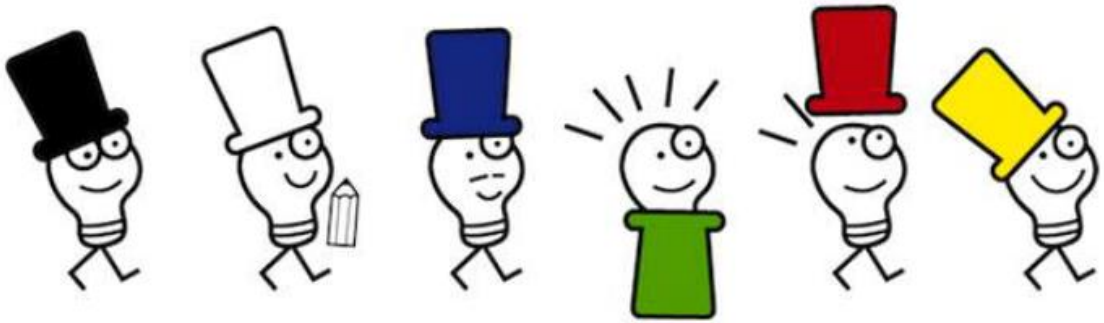
From a standard solution to wacky.




Don’t get discouraged
“Learned Helplessness” is a real thing

The Six Thinking Hats

Edward de Bono



Teamwork.

How to bring out creativity in groups.

That A HA! Moment.

Our best ideas come in, what seems like a flash of inspiration

Engage your subconscious mind …

How to Engage Your Subconscious Mind to Solve Your Toughest Problems

A strategy used by the most-creative people in history

August Birch Sep 7, 2018 · 6 min read ★

https://augustbirch.medium.com/how-you-can-engage-your-subconscious-mind-to-solve-your-toughest-problems-f81cd7fee89

8 Creative Thinking Techniques and The Tools

1 Mind Mapping

The key to mind mapping is to take note of every idea that comes up. Don't neglect anything, no matter how far-fetched it may seem.

2 The Checklist

1. Why?
2. Where?
3. When?
4. Who?
5. What?
6. How

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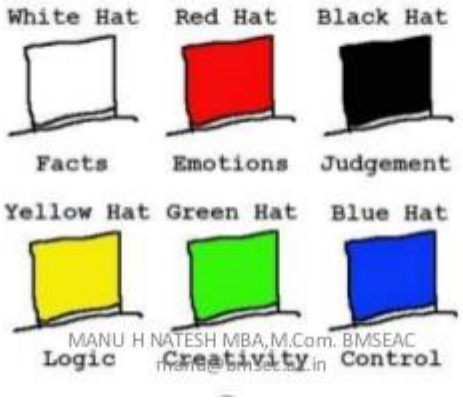
3. Six Thinking Hats

White Hat – Facts, Red Hat – Emotions, Black Hat – Judgement, Caution, Yellow Hat – Logic, Green Hat – Creativity, Blue Hat – Control



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4. Lateral Thinking

look at their situation **differently**, to step sideways for a second if you will. This allows people to re-examine their predicament from a much more creative point of view.

5. Random Word Generation

Simply pick two random words and try and tie your content to it in the most imaginative way possible. Simple as that.

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6. Picture Association

If you're truly stuck for ideas, perform an image search on your topic of choice, pick a random photo. Work backwards from the picture, developing a story around how the photo was taken.

7. Change Perspective

This can often be hard to do, but try putting yourself in other people's shoes.

8. Get Up and Go Out

People underestimate the value of being bored. If you work around screens all day, if can often prove both relaxing and rewarding to just get up and walk about for a bit. Let your mind wander instead of focussing on a task so hard it hurts.

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موانع خلاقیت

ادراکی:

آنچه را که منتظرش هستیم می بینیم

در تفکیک کردن مساله مشکل داریم

نمی توانیم مساله را از زوایای مختلف ببینیم

حسی:

از ریسک کردن می ترسیم

قضاوت می کنیم نه اینکه ایده های جدید خلق کنیم

به اطلاعات صحیح و دقیق دسترسی نداریم

فرهنگی:

تابوها

باور داریم که ریاضیات یا تحلیل بهتر از شهود است

بیانی:

از زبان نادرست برای تبیین/حل مساله استفاده می کنیم

Blockages and barriers that keep creative ideas from fully developing

- Tradition
- Control
- Overspecialization
- Negativism
- Prejudice
- Fear of failure
- Impatience
- Uniformity
- Fear of Ridicule
- Conceit
- Lack of Funding
- Confusion
- Jealousy
- Group Pressure
- Laziness
- Apathy
- Lack of Commitment
- Lack of Support
- Intolerance
- Tenseness
- Fear of Change
- Toxic Nostalgia
- Insecurity

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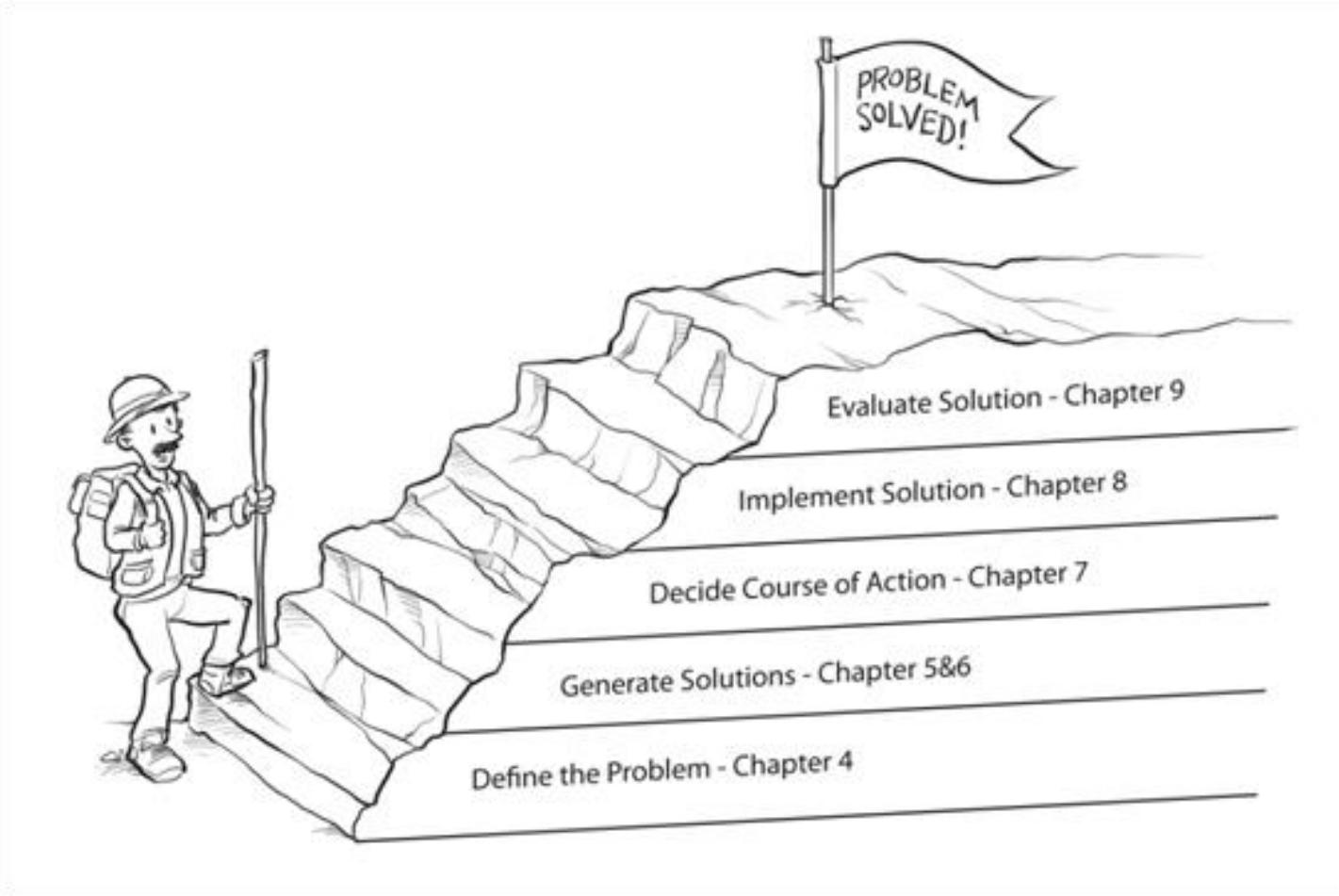
Creative Problem Solving

پنج مرحله ی حل مساله



Creative thinkers

- Consider rejecting standardized formats for problem solving
- Have an interest in a wide range of related and divergent fields
- Take multiple perspectives on a problem
- Have a future orientation
- Have self-confidence and trust in their own judgment

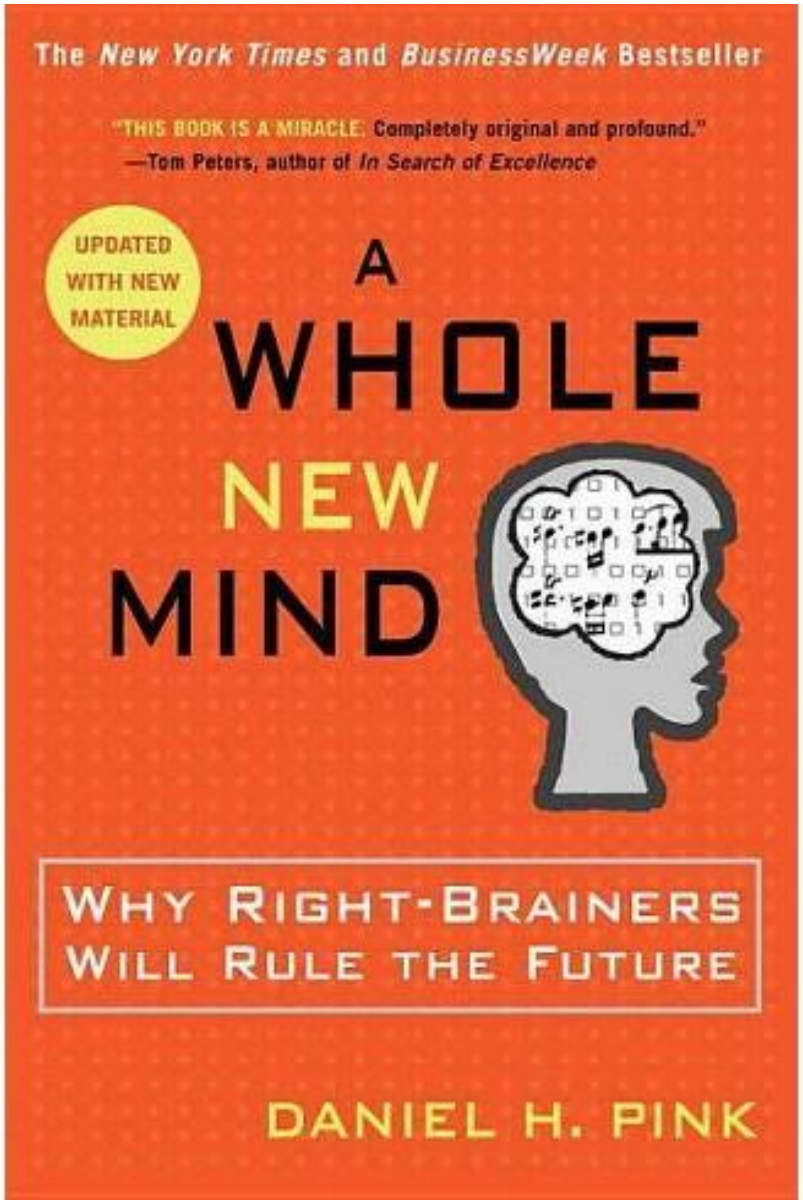
Convergent vs. Divergent Thinking

Divergent thinking: the *creative* generation of multiple solutions to a given problem. In Science and Engineering, this is followed by evaluation of the answers and a choice of optimal solution.

Convergent thinking: the *deductive* generation of the optimum solution to a given problem, usually where there is a convincing interpretation.

Scientists and Engineers typically prefer convergent thinking while artists and performers prefer divergent thinking.

Perhaps this is why many students in CS do not speak of the field as creative. Yet we must have DT to invent and innovate!


The New York Times and BusinessWeek Bestseller
"THIS BOOK IS A MIRACLE. Completely original and profound."
—Tom Peters, author of In Search of Excellence
UPDATED WITH NEW MATERIAL
A WHOLE NEW MIND
WHY RIGHT-BRAINERS WILL RULE THE FUTURE
DANIEL H. PINK

Example of Divergent Thinking

A man who lived on the 10th floor of an apartment building took the elevator to the ground floor every summer morning in order to get to work. When coming home in the late afternoon, the man took the elevator to the 5th floor and walked up the stairs to his apartment on the 10th floor except on rainy days when the man took the elevator all the way to 10.

How do you explain this behavior?

Example of Divergent Thinking

1. The man was a little person and could only reach as high as the 5th floor button. On rainy days, though, he could use his umbrella to hit the 10th floor button.
2. The man enjoyed the exercise of walking up steps but could only manage 5 floors at a time. On rainy days he would create a muddy mess in the hallway so he took the elevator to 10 then.
3. The stairs from the 5th to 10th floor are outside and unprotected. The man took the stairs when convenient to enjoy the late afternoon sun and view overlooking the Pearl river. On rainy days that was out of the question.

Making Connections is Important!

1. Rain connects with umbrella
   umbrella connects with long stiff rod
   long stiff rod connects with enabling a higher reach
   this suggests solution 1.

2. Rain connects with mud
   mud connects with mess
   mess is to be avoided
   this suggests solution 2

3. Absence of rain connects with sun
   sun connects with pleasure outdoors
   this suggests solution 3

Using The Right Language For The Problem

Languages:

Verbalization

- descriptions in words

Visualization

- graphs
- charts
- pictures

Logic

- propositional
- common sense
- non-monotonic ...

Mathematics

- algebra
- calculus ...

Sensory Expression

- laugh, thunder, flowers

CREATIVITY PROCESS

- **Wallis' model of the Creative process**
- Preparation
- Incubation
- Illumination
- Verification

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In the **preparation** stage, we define the problem, need, or desire, and gather any information the solution or response needs to account for, and set up criteria for verifying the solution's acceptability.

In the **incubation** stage, we step back from the problem and let our minds contemplate and work it through. Like preparation, incubation can last minutes, weeks, even years.

In the **illumination** stage, ideas arise from the mind to provide the basis of a creative response. These ideas can be pieces of the whole or the whole itself, i.e. seeing the entire concept or entity all at once. Unlike the other stages, illumination is often very brief, involving a tremendous rush of insights within a few minutes or hours.

In **verification**, the final stage, one carries out activities to demonstrate whether or not what emerged in illumination satisfies the need and the criteria defined in the preparation stage.

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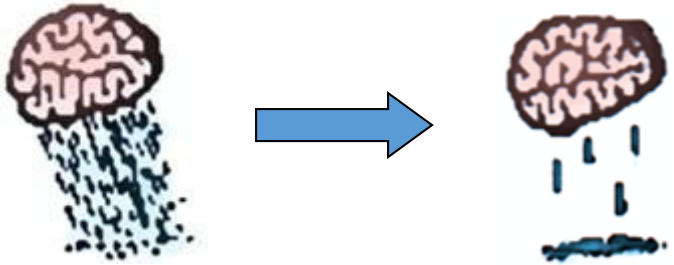
Brainstorming

Comments that reduce Brainstorming to Braindrizzling

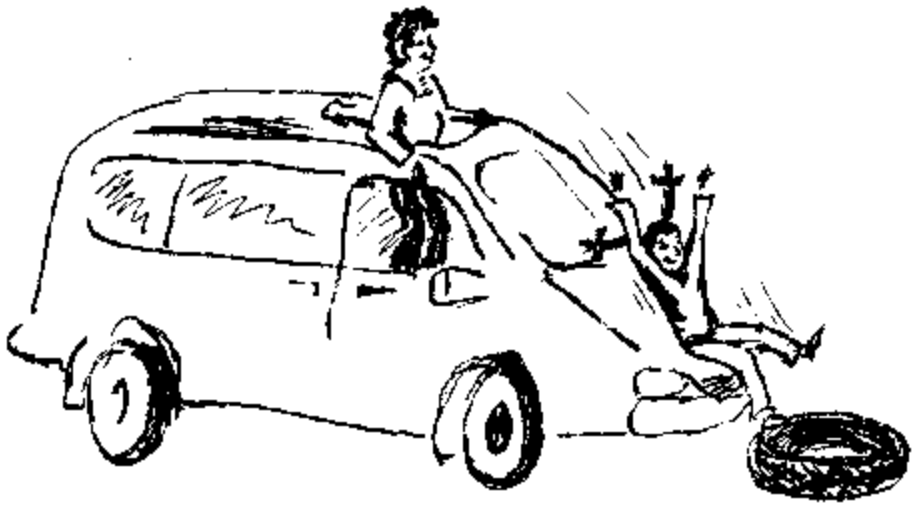


- That won't work
- That's too radical
- It's not our job
- We don't have enough time
- That's too much hassle
- It's against our policy
- We haven't done it that way before
- That's too expensive
- That's not practical
- We can't solve this problem

BRAINSTORMING EXERCISE

Suggest safe playground equipment that could be made from old cars.

Suggested Uses of Old Cars as Equipment for a Children's Playground



Free Association

- Cut the body of the car up to make a 3-D puzzle.
- Take the tires and roll them along the ground.
- Take the seats out and use them as a bed to rest between activities
- Teenagers could take the engine apart and try to put it back together.
- Make a garden by planting flowers inside.
- Use the tires to crawl through as an obstacle course.
- Make into sculpture.
- Take off the doors and use as a goal for hockey.
- Get on the roof and use the car as a slide.

Osborn’s Checklist for Adding New Ideas

Vertical Thinking – (S.C.A.M.P.E.R)

SCAMPER is an acronym for a useful list of active verbs that can be applied as stimuli to make you think differently about the problem.

SCAMPER was defined by Robert Eberle, after an initial list from Brainstorming originator Alex Osborn.

Osborn's Checklist for Adding New Ideas

Vertical Thinking – (S.C.A.M.P.E.R)

- **S**ubstitute
- **C**ombine
- **A**dapt
- **M**odify (Magnify, Minify)
- **P**ut to other uses
- **E**liminate
- **R**earrange

Rerraange

Com bine

Osborn's Checklist for Adding New Ideas

- ***Substitute?*** ..... Who else, where else, or what else? Other ingredient, material, or approach?
- ***Combine?*** ..... Combine parts, units, ideas? Blend? Compromise? Combine from different categories?
- ***Adapt?*** ..... How can this (product, idea, plan, etc.) be used as is? What are other uses it could be adapted to?
- ***Modify?*** ..... Change the meaning, material, color, shape, odor, etc.?
- ***Magnify?*** ..... Add new ingredient? Make longer, stronger, thicker, higher, etc.?
- ***Minify?*** ..... Split up? Take something out? Make lighter, lower, shorter, etc.?

Osborn's Checklist for Adding New Ideas

- ***Put to other uses? .....*** How can you put the thing to different or other uses? New ways to use as is? Other uses if it is modified?
- ***Eliminate? .....*** What can you eliminate? Remove something? Eliminate waste? Reduce time? Reduce effort? Cut costs?
- ***Rearrange? .....*** Interchange parts? Other patterns, layouts? Transpose cause and effect? Change positives to negatives? Reverse roles? Turn it backwards or upside down? Sort?

Osborn's Checklist for Adding New Ideas

- **S**ubstitute: Use the car seats in swings.

- **C**ombine: Use the side panels or roof to make a huge canopy or fort.

- **A**dapt: Take the hood off and use it as a toboggan in winter.

- **M**odify: Crush the cars into cubes and allow the kids to climb on the blocks.

Osborn’s Checklist for Adding New Ideas

•**P**ut to other uses: Remove the engines and side panels and make go-carts.

•**E**liminate: Throw away the rims and use the tires for a "romper room"/jumping pit.

•**R**earrange: Turn the car upside down and use it as a teeter-totter.

Futuring

- *Laser to vaporize car*
- *Vapor separated into molecular components*
- *Use components to make polymers*
- *Polymers reassembled into toys (giant legos)*

Lateral Thinking: Other People's View

- Think about walking around on your knees.
  - – How would this change your perspective--that is, imagine the playground from a child's height.
- What was your favorite playground toy?
  - – How could this be mimicked with used auto parts?

Example: From a child's viewpoint, the complete car would be an exciting change to pretend to be a "grown-up." Just take off the doors and remove other equipment (electrical, etc.) and let the kids pretend to drive. Just leave the car as it is!

Brainstorming Techniques

Basic Brainstorming

- Get a group of people together to address a problem, challenge, or opportunity
- Ask your group to generate as many ideas as possible—no matter how “off the wall” they may seem. During this period, no criticism is allowed.
- Review the ideas, select the most interesting, and then lead a discussion about how to combine, improve, and/or implement the ideas.

Analytic Brainstorming

1. Mind Mapping

- Mind mapping is a visual tool for enhancing the brainstorming process. In essence, you're drawing a picture of the relationships among and between ideas.
- Start by writing down your goal or challenge and ask participants to think of related issues. Layer by layer, add content to your map so that you can visually see how, for example, a problem with the telephone system is contributing to issues with quarterly income. Because it's become so popular, it's easy to find mind mapping software online. The reality, though, is that a large piece of paper and a few markers can also do the job.

Analytic Brainstorming

2. Reverse Brainstorming

- Ordinary brainstorming asks participants to solve problems. Reverse brainstorming asks participants to come up with great ways to **cause** a problem. Start with the problem and ask “how could we cause this?” Once you've got a list of great ways to create problems, you’re ready to start solving them!

Analytic Brainstorming

3. Gap Filling

- Start with a statement of where you are. Then write a statement of where you'd like to be. How can you fill in the gap to get to your goal? Your participants will respond with a wide range of answers from the general to the particular. Collect them all, and then organize them to develop a vision for action.

Analytic Brainstorming

4. Drivers Analysis

- Work with your group to discover the drivers behind the problem you're addressing. What's driving client loyalty down? What's driving the competition? What's driving a trend toward lower productivity? As you uncover the drivers, you begin to catch a glimpse of possible solutions.

Analytic Brainstorming

5. SWOT Analysis

- SWOT Analysis identifies organization strengths, weaknesses, opportunities and threats. Usually, it's used to decide whether a potential project or venture is worth undertaking. In brainstorming, it's used to stimulate collaborative analysis. What are our real strengths? Do we have weaknesses that we rarely discuss? New ideas can come out of this tried-and-true technique.

Analytic Brainstorming

Analytic Brainstorming

6. The Five Whys

- Another tool that’s often used outside of brainstorming, the Five Whys can also be effective for getting thought processes moving forward. Simply start with a problem you’re addressing and ask “why is this happening?” Once you've got some answers, ask “why does this happen?” Continue the process five times (or more), digging deeper each time until you’ve come to the root of the issue.

Analytic Brainstorming

7. Starbursting

- Create a six-pointed star. At the center of the star, write the challenge or opportunity you're facing. At each point of the star, write one of the following words: who, what, where, when, why, and how. Use these words to generate questions. Who are our happiest clients? What do our clients say they want? Use the questions to generate discussion.

The Ultimate Cheatsheet for Critical Thinking

Want to exercise critical thinking skills? Ask these questions whenever you discover or discuss new information. These are broad and versatile questions that have limitless applications!

Who	... benefits from this? ... is this harmful to? ... makes decisions about this? ... is most directly affected?	... have you also heard discuss this? ... would be the best person to consult? ... will be the key people in this? ... deserves recognition for this?
What	... are the strengths/weaknesses? ... is another perspective? ... is another alternative? ... would be a counter-argument?	... is the best/worst case scenario? ... is most/least important? ... can we do to make a positive change? ... is getting in the way of our action?
Where	... would we see this in the real world? ... are there similar concepts/situations? ... is there the most need for this? ... in the world would this be a problem?	... can we get more information? ... do we go for help with this? ... will this idea take us? ... are the areas for improvement?
When	... is this acceptable/unacceptable? ... would this benefit our society? ... would this cause a problem? ... is the best time to take action?	... will we know we've succeeded? ... has this played a part in our history? ... can we expect this to change? ... should we ask for help with this?
Why	... is this a problem/challenge? ... is it relevant to me/others? ... is this the best/worst scenario? ... are people influenced by this?	... should people know about this? ... has it been this way for so long? ... have we allowed this to happen? ... is there a need for this today?
How	... is this similar to _______? ... does this disrupt things? ... do we know the truth about this? ... will we approach this safely?	... does this benefit us/others? ... does this harm us/others? ... do we see this in the future? ... can we change this for our good?

Quiet Brainstorming

8. Brain-Netting (Online Brainstorming)

- Perhaps not surprisingly, brain netting involves brainstorming on the Internet. This requires someone to set up a system where individuals can share their ideas privately, but then collaborate publicly. There are software companies that specialize in just such types of systems, like Slack or Google Docs.
- Once ideas have been generated, it may be a good idea to come together in person, but it's also possible that online idea generation and discussion will be successful on its own. This is an especially helpful approach for remote teams to use, though any team can make use of it.

Quiet Brainstorming

9. Brainwriting (or Slip Writing)

- The brain writing process involves having each participant anonymously write down ideas on index cards. The ideas can then be randomly shared with other participants who add to or critique the ideas. Or, the ideas can be collected and sifted by the management team. This approach is also called “Crawford Slip Writing,” as the basic concept was invented in the 1920’s by a professor named Crawford.

Quiet Brainstorming

10. Collaborative Brainwriting

- Write your question or concern on a large piece of paper and post it in a public place. Ask team members to write or post their ideas when they're able, over the course of a week. Collate ideas on your own or with your group's involvement.

Role Play Brainstorming

11. Role Storming

- Ask your participants to imagine themselves in the role of a person whose experience relates to your brainstorming goal (a client, upper management, a service provider). Act out a scene, with participants pretending to take the other's point of view. Why might they be dissatisfied? What would it take for them to feel better about their experience or outcomes?

Role Play Brainstorming

12. Reverse Thinking

- This creative approach asks, “what would someone else do in our situation?” Then imagine doing the opposite. Would it work? Why or why not? Does the “usual” approach really work well, or are there better options?

Role Play Brainstorming

13. Figure Storming

- Choose a figure from history or fiction with whom everyone is familiar—Teddy Roosevelt, for example, or Mother Theresa. What would that individual do to manage the challenge or opportunity you're discussing? How might that figure's approach work well or poorly?

Brainstorming with Support

14. Step Ladder Brainstorming

- Start by sharing the brainstorming challenge with everyone in the room. Then send everyone out of the room to think about the challenge—except two people.
- Allow the two people in the room to come up with ideas for a short period of time, and then allow just one more person to enter the room. Ask the new person to share their ideas with the first two before discussing the ideas already generated.
- After a few minutes ask another person to come in, and then another. In the long run, everyone will be back in the room—and everyone will have had a chance to share his or her ideas with colleagues.

Brainstorming with Support

15. Round Robin Brainstorming

- A “round robin” is a game in which everyone gets a chance to take part. That means everyone:
- must share an idea and
- wait until everyone else has shared before suggesting a second idea or critiquing ideas
- This is a great way to encourage shy (or uninterested) individuals to speak up while keeping dominant personalities from taking over the brainstorming session.

Brainstorming with Support

16. Rapid Ideation

- This simple technique can be surprising fruitful. Ask the individuals in your group to write down as many ideas as they can in a given period of time. Then either have them share the ideas aloud or collect responses. Often, you'll find certain ideas popping up over and over. In some cases, these are the obvious ideas. But in some cases, they may provide some revelations.

Brainstorming with Support

17. Trigger Storming

- This variant on the round robin approach starts with a “trigger” to help people come up with thoughts and ideas. Possible triggers include open ended sentences or provocative statements. For example, “Client issues always seem to come up when ____,” or “The best way to solve client problems is to pass the problem along to someone else.”

Radically Creative Brainstorming

18. Charrette

- Imagine a brainstorming session in which 35 people from six different departments are all struggling to come up with viable ideas. The process is time consuming, boring, and—all too often—unfruitful. The Charrette method breaks up the problem into smaller chunks, with small groups discussing each element of the problem for a set period of time. Once each group has discussed one issue, their ideas are passed on to the next group who builds on them. By the end of the Charrette, each idea may have been discussed five or six times—and the ideas discussed have been refined.

Radically Creative Brainstorming

19. "What If" Brainstorming

- What if this problem came up 100 years ago? How would it be solved? What if Superman were facing this problem? How would he manage it? What if the problem were 50 times worse—or much less serious than it really is? What would we do? These are all different types of “what if” scenarios that can spur radically creative thinking—or at least get people laughing and working together!

سرفصل مطالب

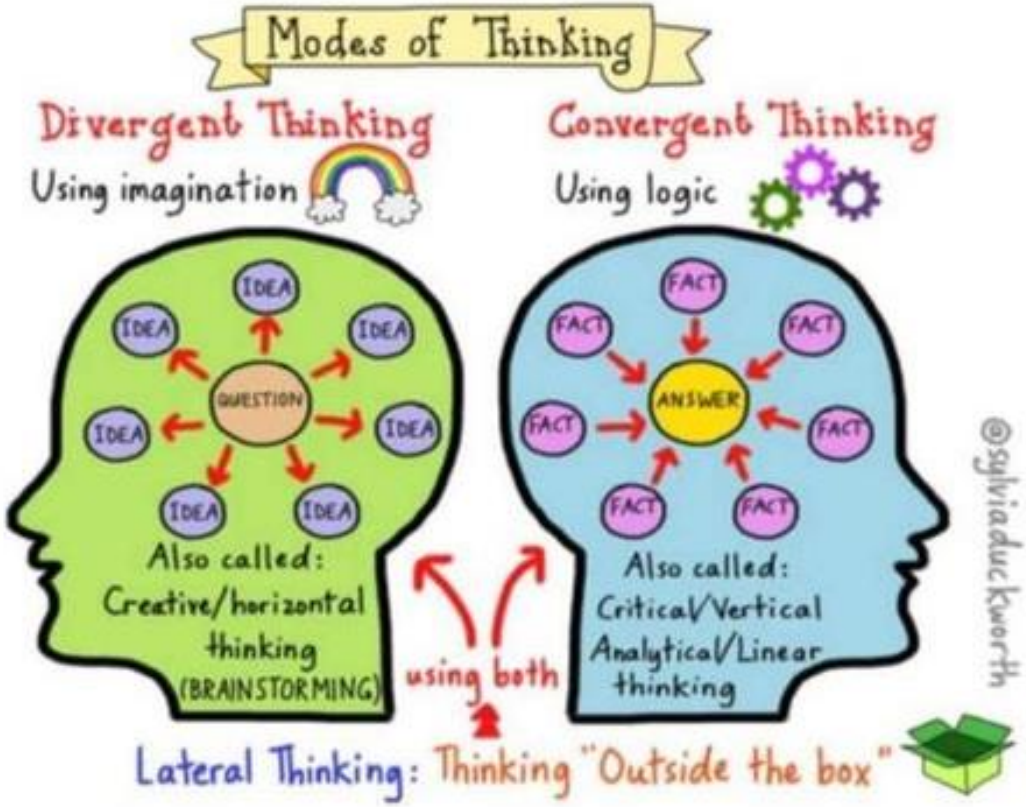
- خلاقیت چیست؟
- روشهای پرورش خلاقیت
- حل خلاقانه ی مسائل
- Brainstorming
- جمع بندی

بیاندیشیم

- می توانیم خلاقیت خود را بیش از پیش پرورش دهیم.

- چقدر به چگونه فکر کردن خود (مثلا از نظر همگرا یا واگرا بودن) می اندیشیم؟

- آیا با من هم عقیده هستید که جای این مطالب در دانشگاههای ما خالی است؟



LATERAL, DIVERGENT & CONVERGENT THOUGHT

Creative Thinking

چگونه یک متفکر خلاق شویم؟

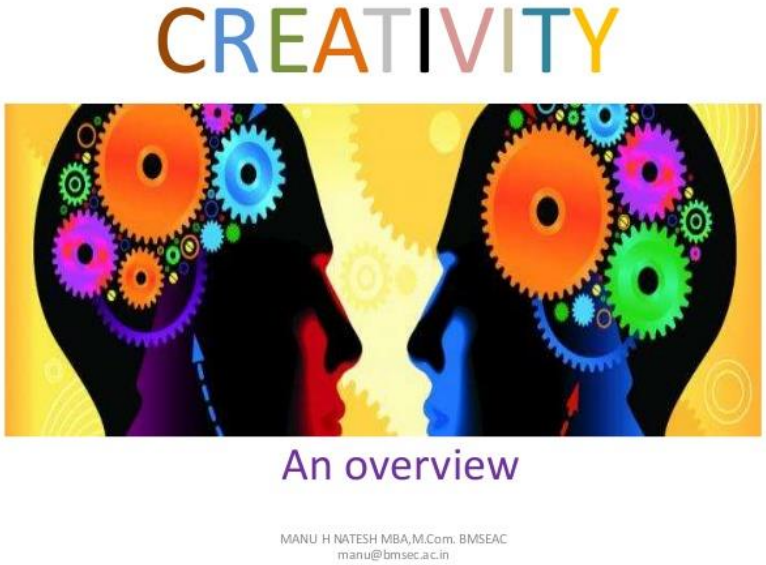
1. قاتلان خلاقیت را حذف کنیم.
2. با پرسیدن سوالات درست، خلاقانه فکر کنیم:
   - چرا این کار باید اینگونه انجام شود؟
   - مساله ی ریشه ای چیست؟
   - مشکلات اساسی کدامند؟
   - این مساله مرا یاد چه چیزی می اندازد؟
   - عکس این مساله چگونه است؟
   - با چه استعاره هایی می توانم این مساله را به سادگی بیان کنم؟
   - چرا این مساله مهم است؟
   - دشوارترین یا گران ترین راه حل این مساله چیست؟
   - چه کسی از زاویه ی متفاوتی به این مساله نگاه می کند؟
   - اگر این کار را اصلا انجام ندهیم، چه خواهد شد؟

Creative Thinking

چگونه یک متفکر خلاق شویم؟

3. محیطی خلاقیت پرور درست کنیم.
   - خلاق ها را تشویق کنیم.
   - به افراد تیممان اعتماد زیادی داشته باشیم.
   - بر **innovation** تمرکز کنیم و نه فقط **invention**.
   - به همکارانمان اجازه دهیم از خطوط عبور کنند.
   - قدر «قدرت رویاها» را بدانیم.
4. زمان خود را بیشتر با انسانهای خلاق بگذرانیم.
5. از چارچوبها خارج شویم.

References



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Creativity

Innovation and Invention are impossible without **creativity**. **Creativity**: What, Why, and How. Convergent vs. Divergent Thinking. Divergent thinking: the **creative** ...

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PowerPoint Version: Chapter 7 - Brainstorming - University of ...

Brainstorming Methods. 4. Lateral Thinking. Free Association. (**Unstructured** Idea Generation). Vertical Thinking. The. **Brainstorming** Process. OSBORN'S

BUSINESS > BRAINSTORMING

19 Top Brainstorming Techniques to Generate Ideas for Every Situation

by Lisa Jo Rudy 23 Apr 2020 Length: Medium Languages: English


وَهُوَ الْعَلِيمُ الْحَكِيمُ
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Backup Slides

Critical Thinking (A few words)

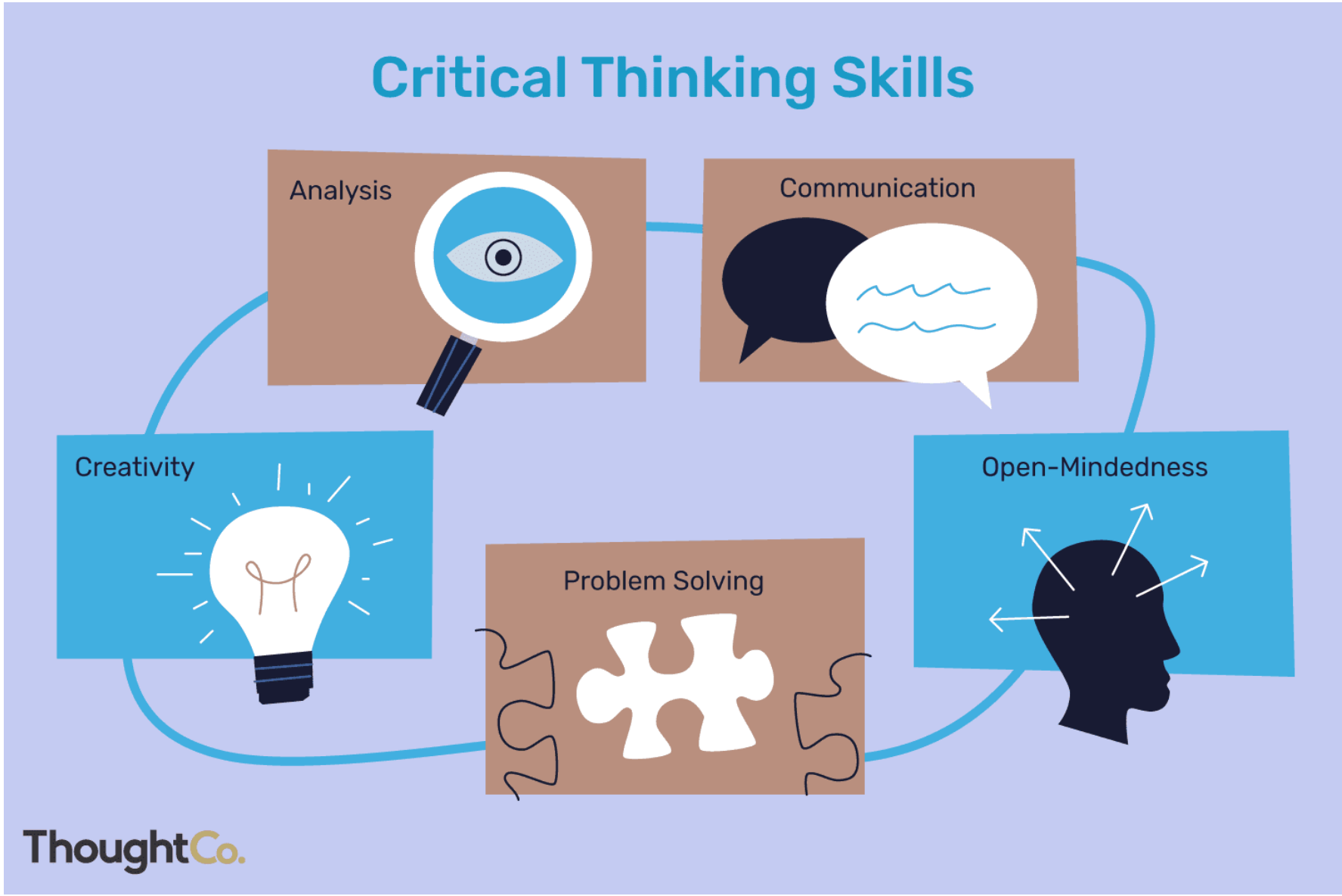
Top 10 skills

in 2020

1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

in 2015

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity


Critical Thinking Skills
Analysis
Communication
Creativity
Open-Mindedness
Problem Solving
ThoughtCo.

1. Challenge all assumptions

2. Suspending judgment

3. Revising conclusions based on new evidence

4. Emphasizing data over beliefs

5. The neverending testing of ideas

6. The perspective that mistakes are data

7. The earnest consideration of possibilities and ideas without (always) accepting them

8. Looking for what others have missed

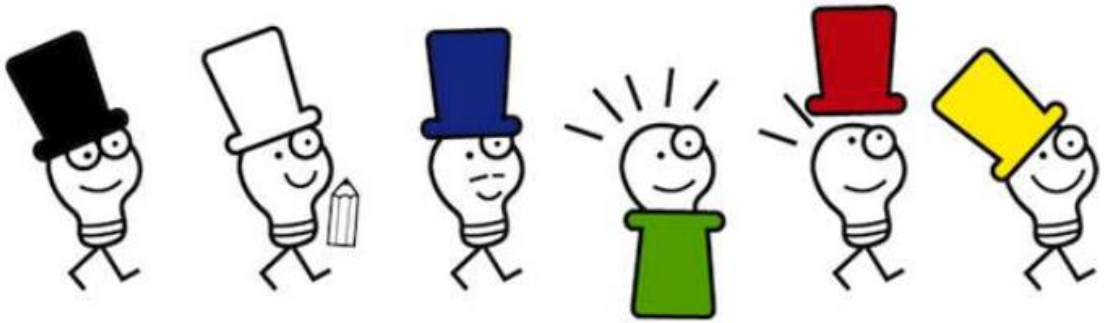
8 SCIENCE - BASED

Strategies For Critical Thinking

teachthought
WE GROW TEACHERS

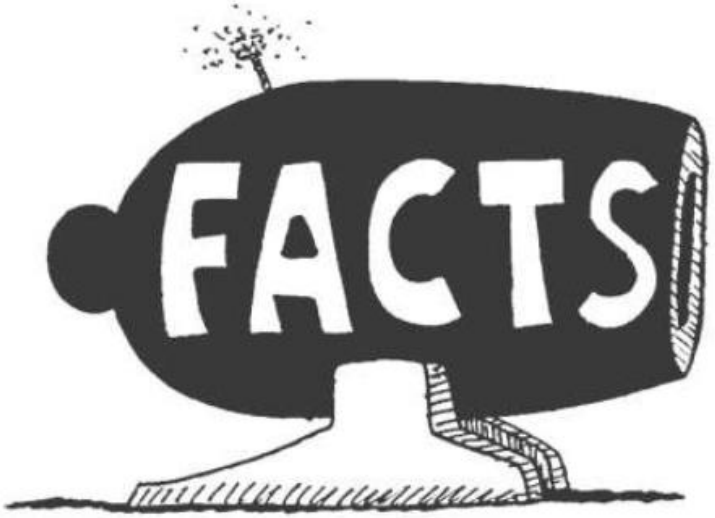
The Six Thinking Hats

Edward de Bono



The White Hat

Only The Facts



- What do you know about
- What are the facts
- What do you need or want to know
- Where would you go to find out this information

The Red Hat

Our Feelings

- What are you feeling now
- Which solution is best based on your feelings
- What prejudices are present
- Do you have a gut feeling
- What does your intuition tell you

The Black Hat

The Devil's Advocate

- What should you be cautious about
- Of what should you be careful
- What are the difficulties
- Why won't this work
- What are the risks

The Yellow Hat

The Glass Half Full

- What is good about this
- What would be a positive outcome
- Can this be made to work
- What do you like about this
- What can be the value of this

The Green Hat

New Ideas

- Can you create another way to do this
- How would you solve this problem
- What other possibilities are there
- What are some other approaches to this issue?
- Can this be done in a more simple way?

The Blue Hat

The Process

- Summary of everything
- What's next
- What is the action plan
- Outcome of the meeting
- Are we asking the right questions

Using The Right Language For The Problem

One morning, exactly at sunrise, a Buddhist monk began to climb a tall mountain from a temple gift shop. The narrow path, no more than a foot or two wide, spiralled around the mountain to a glittering temple at the summit. The monk ascended the path at varying rates of speed, stopping many times along the way to rest and to eat the dried fruit he carried with him. He reached the temple shortly before sunset. After several days of fasting and meditation, he began his journey back down the same path, starting at sunrise and again walking at variable speeds with many pauses along the way. His average speed descending was greater than his average climbing speed so he arrived at the gift shop before sunset.

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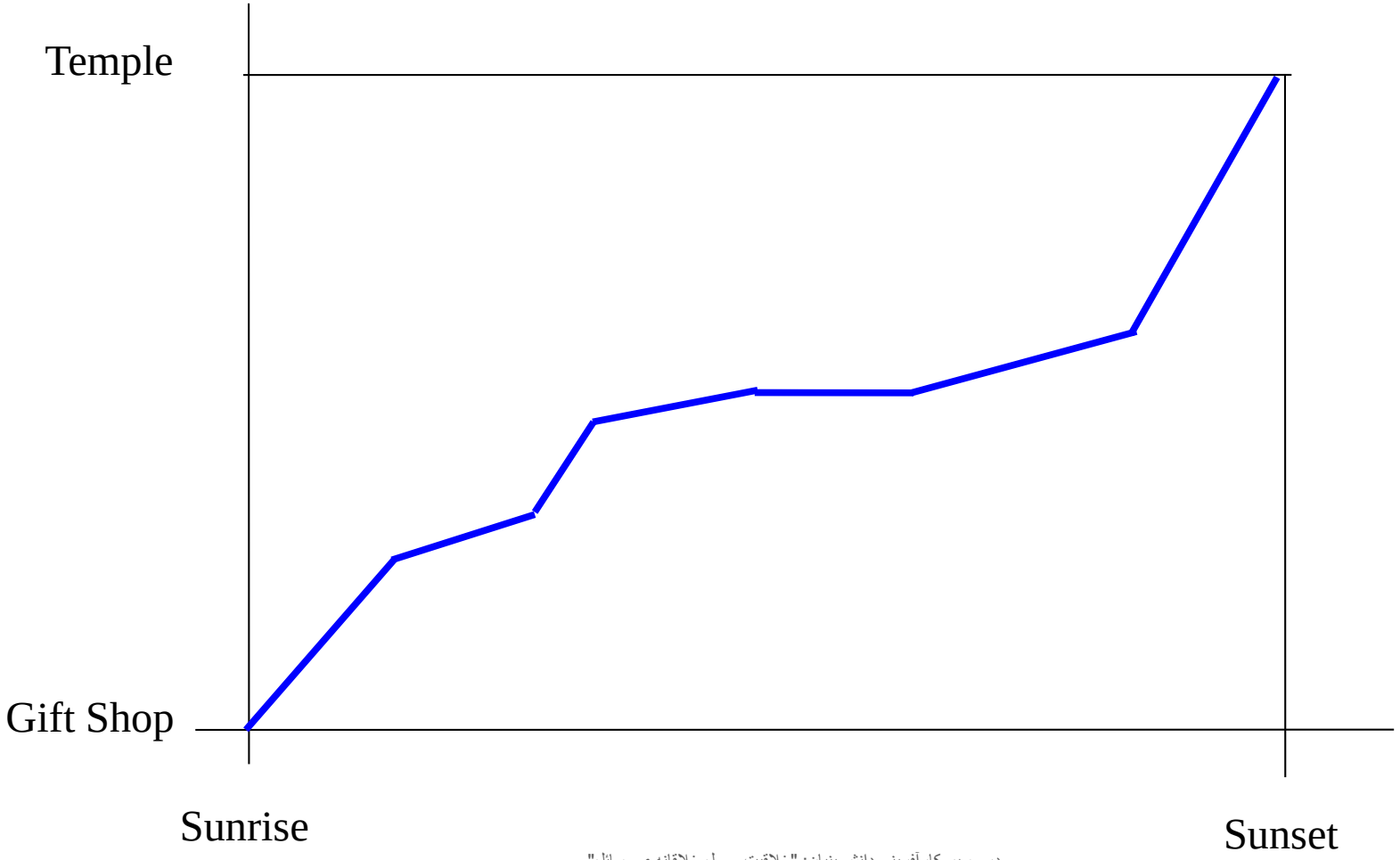
Prove that there is a spot along the path the monk will occupy on both trips at precisely the same time of the day.

Using The Right Language For The Problem

Best solved visually:



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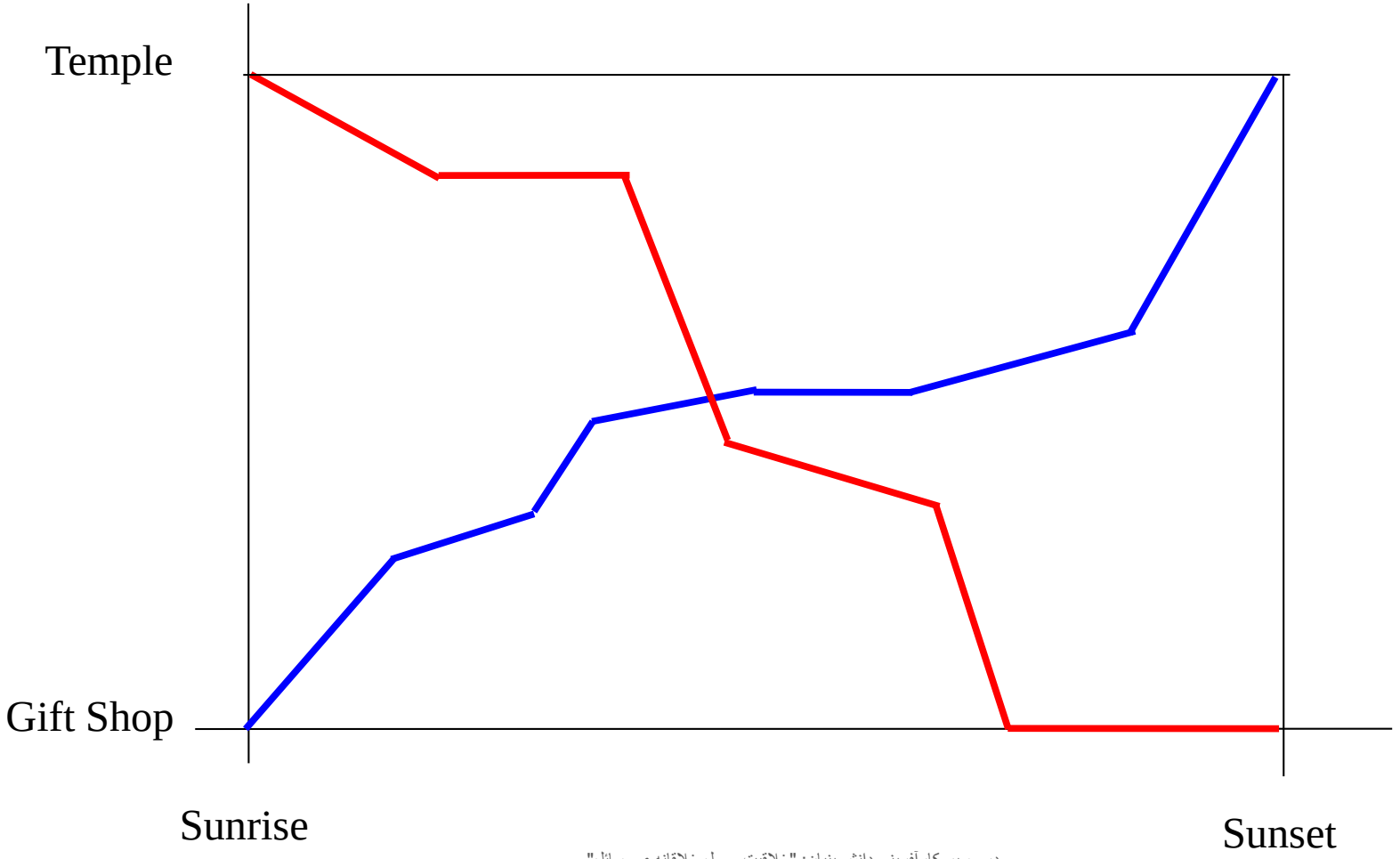

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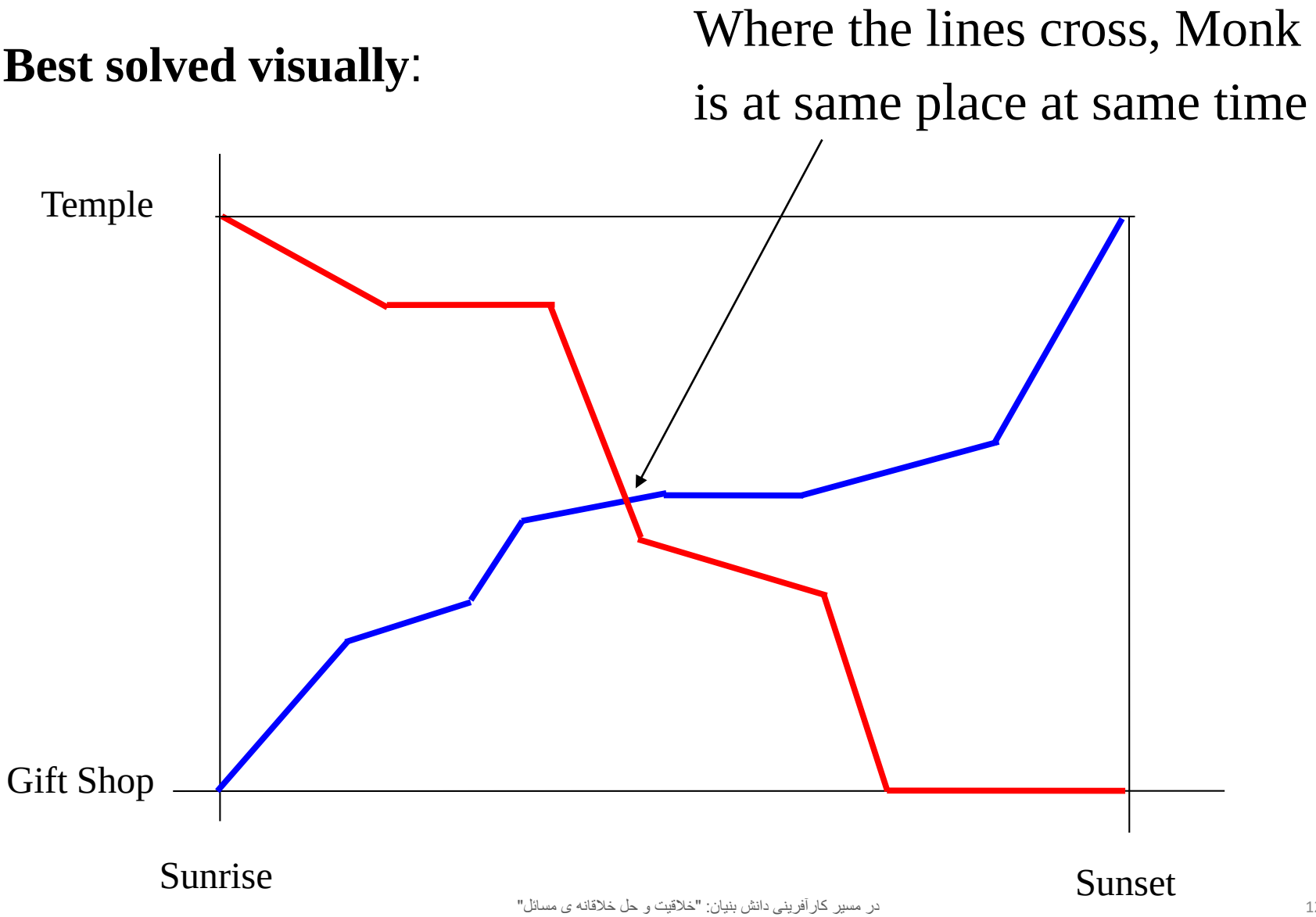

Using The Right Language For The Problem

Three light bulbs in room A are connected independently to three switches in room B. The lights are not visible from room B. The problem is to determine which switch is which being allowed just one visit to room A from B.

A B

Logic Mathematics Words Visualization Sensory

Using The Right Language For The Problem

Best solved with sensory thinking:

Number switches 1,2,3. Turn 1 on for five minutes. Turn it off and turn on and leave on number 2.

Visit room A.

The bulb that is off and warm is connected to 1.

The bulb that is on is connected to 2.

The remaining bulb is connected to 3.