



Creative Thinking

Reading & Vocabulary Development
for CS50x Learners

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□ How to Study?

- **Step 1:**

In the first section (Reading), read through the article once completely.

Don't worry about understanding every word—just focus on getting a general sense of the content.

- **Step 2:**

Next, check out the list of words and expressions from the text.

See which ones are familiar to you and which ones are new.

Some unfamiliar words can be guessed from the context, and some familiar ones might have a different meaning here than usual.

- **Step 3:**

In the following sections, you'll find explanations and example sentences for those words and phrases.

Some of them might not appear directly in the article, but since they're related, it's a good opportunity to get to know them.

This process continues throughout the material.

You can study at your own pace, take breaks whenever you need to, and come back to it later.

□ About the Vocabulary

The vocabulary in this article isn't sorted by language level, but it generally falls into three categories:

- 1. High-frequency**, common words that you'll remember naturally over time through repetition and exposure.
- 2. Specialized IT and computer terms** that will become easier to learn the more you engage with tech-related content.
- 3. Less common words** that you might only see in a few specific contexts.

❖ Important Note

You don't need to memorize any of these words or expressions my friend. They're just here to support your learning journey. The more you come across them in different contexts, the more naturally they'll stick.

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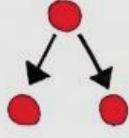
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This is an outtake of my [Master's thesis](#) on what role creative thinking plays when we think about the future. Part of this research was to go through a vast amount of literature on creative thinking, which I categorised into five main types of creative thinking:

				
DIVERGENT THINKING (Exaggeration)	LATERAL THINKING (Out-of-the-box)	AESTHETIC THINKING (Beauty and taste)	SYSTEMS THINKING (Synthesis towards a whole)	INSPIRATIONAL THINKING (Emergent, radical insight)

Much of the management research and general literature combines these five types into one type, simply called 'creative thinking'. This is based on old bi-polar concepts such as right vs. left-brain thinking or rational vs. intuitive thinking. So that's why we often hear that a person is either a right-brain or a left-brain thinker, or have either a creative or a logical personality. That can certainly be useful sometimes. But much of the research around creativity paints a more nuanced picture.

There are similarities and correlations between the five clusters, and instead of five, I could have picked ten. Another challenge in my study was that much of the literature on creativity is based on personal stories, which makes any classification difficult as it can never be proven whether different accounts of creativity and creative thinking are referring to the same experiences for different people.

□ Phrases & Vocabulary

an outtake of
vast amount of literature
bi-polar concepts
a more nuanced picture
different accounts of
make classification difficult
on/about

outtake

- a piece of film or a song that is not in the final version of a program, movie, or record.
- content that is excluded from a final version of written works

literature

- writing that has lasting value as art
- all the information relating to a subject, especially information written by specialists
- printed material published by a company, etc. to encourage people to buy its products or services

classical/modern literature

sales/promotional literature

literature on/about sth

bi- [prefix]

two

bilingual (= speaking two languages)

bimonthly (= happening twice in a month or once every two months)

BI

Business Intelligence (BI) consists of strategies, methodologies, and technologies used by enterprises for data analysis and management of business information.

polar

- relating to the North or South Pole.
- directly opposite in character or tendency.

concept [noun]

- a principle or idea
- [marketing] an idea for a new product or a way to sell a product

not have any concept/have no concept of something
to not understand about something

nuanced [adj.]

characterized by subtle shades of meaning or expression

account

- a report or description of an event or experience.

Synonyms:

story, narration, narrative

- an agreement with a store or business that allows you to buy things and pay for them later
- a customer who does business with a company

be of no/little account [formal]

to not be important

□ Exercise 1

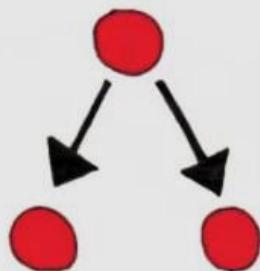
Fill in the blanks with the words below. Some word forms may need to be changed.

literature(x2) concept(x2) nuanced
account(x2) dent shift

1. She's just a child - she has no _____ of how much things cost.
2. It's important to keep up-to-date with the _____ in your field.
3. Her singing had a _____ quality, with subtle _____ in tone and emotion.
4. Product differentiation is an important _____ in marketing.
5. He kept a detailed _____ of the suspect's movements.
6. They handed out _____ at the meeting about their new software.
7. If the advertising agency loses this _____, it will make a big _____ in their profits.

[Answer Key](#)

1. Divergent thinking



“The work of art is the exaggeration of the idea”.

– André Gide

The American psychologist J.P. Guilford was the first who proposed that an element of divergence is involved in the creative process. He made a distinction between convergent and divergent production, which he also called convergent and divergent thinking.

Divergent thinking is the process of thought where a person uses **flexibility**, **fluency** and **originality** to explore as many solutions or options to a problem or issue as possible. It is the opposite of convergent thinking, which has the characteristic to focus on only one idea or single solution.

Brainstorming is a typical example of divergent thinking, where “downloading” or emptying the brain of a certain topic takes place. This technique is however limited in that it builds on releasing the ideas that are already stored in a person’s brain, and not to generate any new ideas.

Other tools for divergent thinking are for instance to assume that something known for certain is false, or to explore ideas that cause discomfort.

□ Phrases & Vocabulary

divergent

divergence

convergent

propose

make a distinction between

brainstorming

it builds on (sth)

take place: occur, happen

exaggeration: overstatement,
overemphasis

divergent [adj.]

tending to be different or develop in different directions

divergent paths

divergent interpretations

Synonyms:

differing, different, varying

Antonym:

convergent

divergence [noun]

the situation in which two things become different

divergence between/from

a divergence of opinion

a considerable/significant/sharp divergence

Synonyms:

difference, separation, division

Antonym:

convergence

convergent [adj.]

the situation in which two things become different

divergence between/from

a divergence of opinion

a considerable/significant/sharp divergence

propose

- to suggest or state (a possible plan or action) for consideration

propose reform

propose to do sth

propose doing sth

propose that

- If you propose to someone, you ask that person to marry you
- to intend to do something [formal]
- to suggest someone for a position or as a member of an organization

brainstorming

an activity or business method in which people meet in a group to suggest a lot of new ideas to choose from for possible development
brainstorming sessions

build on sth

to use a success or achievement as a base from which to achieve more success

build in/into sth

to include something as part of a plan, system, or agreement

□ Exercise 2

Fill in the blanks with the words below. Some word forms may need to be changed.

divergence(x2) convergence(x2) propose(x2)
on in/into affordable approach

1. After years of conflict, the two countries' leaders _____ on a peace agreement.
2. She _____ a tax reform designed to make basic insurance more _____.
3. A design team might _____ by brainstorming many different product features, then _____ by selecting a few key features to include in the final product.
4. There are widely divergent _____ to the problem
5. The two politicians presented sharply _____ views on the proposed tax cuts.
6. How do you _____ tackling this problem?
7. We need to build _____ our reputation to expand the business.
8. New safety regulations are being built _____ the proposal.

[Answer Key](#)

2. Lateral thinking



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

– Edward De Bono

Creativity researcher Edward De Bono came up with the term **lateral thinking** in 1967 to “distinguish between artistic creativity and idea creativity”. The term was invented as an alternative to step-by-step thinking, so-called vertical thinking, which is justified with sequential steps based on logic.

Lateral thinking can be used for generation of new ideas and problem solving as it by definition leaves the already-used behind and looks for completely new options. This type of thinking is based on avoiding the intrinsic limitations in the brain, which rapidly sees patterns and handles information in a distinctive way, where long thought sequences are not broken up once formed. Instead, lateral thinking tools and techniques can be used to restructure and escape such “clichéd” patterns and think “outside the box”.

Lateral thinking is related to divergent thinking, as discussed above. Both have the purpose to break out of habitual ways of thinking. Both falls “outside the box”, but divergent thinking is still sequential in that it follows on an earlier thought, while lateral thinking has no direct connection to an earlier thought.

If rational or vertical thinking is described as following the most likely path; divergent thinking is following an extreme path, while lateral thinking is following the least likely path.

□ Phrases & Vocabulary

come up with sth

lateral thinking (horizontal thinking)

distinguish between sth

so-called vertical thinking

be justified with

sequential

leave sth behind

intrinsic limitations in the brain

restructure

clichéd

break out of habitual ways of thinking

an extreme path

come up with sth

- to suggest or think of an idea or plan

come up with a plan/idea/solution

come up with a name/title/advert

Synonyms:

think up, invent, create

- to manage to find or produce something that is needed, usually money

lateral

related to the side of an object or to sideways movement

distinguish between sth

to show or understand a difference between two similar things

so-called

- commonly named
- falsely or improperly so named

sequential

following a particular order; performed or used in sequence

an intrinsic limitation

you can use it to refer to natural, inherent restrictions such as the constraints of time, space or resources

a constraint or deficiency that is inherent to something, meaning it stems from its basic nature or constitution and is not an external factor

justified

- having or shown to have a just, right, or reasonable basis
- (typography) aligned evenly at the margin

clichéd

something is overused, unoriginal, and therefore boring or predictable, often used to describe phrases, ideas, or situations.

The term "cliché" often has a negative connotation, suggesting a lack of originality or creativity.

extreme

- extreme opinions, ideas, etc., are beyond the usual range of variety and would seem unreasonable to most people.
- the largest possible amount or degree of something

break out

- to escape from a place or a situation
- "**break out** from habitual ways of thinking" to escape or free oneself from the ingrained and often unconscious patterns of thought that one typically relies on.
- to begin, or to begin using or doing something

□ Exercise 3

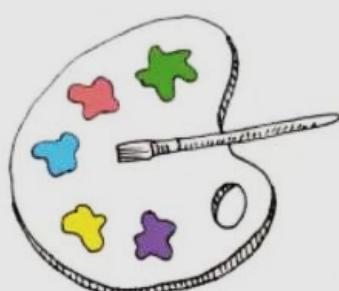
Fill in the blanks with the words below. Some word forms may need to be changed.

(come up with) name sequential limitation
extreme distinguish rely consider (break out)

1. Next you need to come up with a _____ for your product.
2. There are intrinsic _____ to human memory, which is why we _____ on external tools.
3. He has _____ opinions when it comes to politics, often expressing views that are _____ radical by most people.
4. The analyses involved three _____ steps.
5. Where am I supposed to _____ a thousand dollars?
6. He's color-blind and can't _____ between red and green easily.
7. She needed to _____ of her daily routine and travel somewhere new.

[Answer Key](#)

3. Aesthetic thinking



"It took me four years to paint like Raphael, but a lifetime to paint like a child".

– Pablo Picasso

The philosophy of aesthetics concerns the creation and appreciation of art and beauty. Taste is also a key concept here and the study of for instance form, colour and shape can augment a person's aesthetic thinking.

This type of thinking involves producing or discovering things, which are pleasant, harmonious and beautiful to our senses. It is an ancient form of thinking within us humans, and can be learned by anyone.

Some of the types of aesthetic thinking are visual and spatial, where knowledge of structure, composition, colour schemes and shapes can be used to make things aesthetically pleasing. Many architects, designers, painters and other aesthetic thinkers through the ages have been fascinated with mathematical characteristics of aesthetics, and how patterns, ratios and proportions found in nature can be represented by numbers and also in creative pursuits. Music, drama and other forms of culture can also be considered aesthetic thinking, where tempo, dramaturgy, rhythm, melody and other structural elements are applied to make output beautiful and harmonious.

Scientific formulas themselves can also be considered beautiful, and many chemists, physicists and mathematicians consider their work elegant and aesthetic. Many aspects of storytelling can also be included in this category, as this “art” is based on dramaturgic elements, pace, a well-crafted dialogue, etc.

It is however important to emphasize that this type of creative thinking might be enough to build a story, but in order to create a great work of art, other types of creative thinking are needed too. The same goes for all work, which is built on aesthetic thinking. A person will not become a great artist only by going to art school.

□ Phrases & Vocabulary

concern

augment

spatial

creative pursuits

tempo

dramaturgy

elegant and aesthetic

the same goes for all work

well-crafted: well-made, well-executed

concern

- (worry) to cause worry to someone
- (involve) to be important to someone or to involve someone directly
- (business) a company

augment

to make something larger or fuller by adding something to it

augment income/the budget

augment the water supply

augment art collection

augment the storage space

Synonyms:

Increase, make larger/bigger/greater

pursuit [noun]

- the action of following or pursuing someone or something
- an activity of a specified kind, especially a recreational or athletic one

spatial

relating to the position, area, and size of things

spatial ability/awareness

spatial dimension/location

spatial interaction/perspective/pattern

tempo

- the speed at which an event happens
- the speed at which a piece of music is played

Synonyms:

pace, race, speed

dramaturgy

the theory and practice of dramatic composition

□ Exercise 4

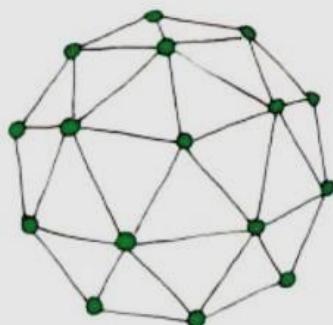
Fill in the blanks with the words below. Some word forms may need to be changed.

concern(x2) augment(x2) pursuit(x2) space

1. Matters of pollution and the environment
_____ us all.
2. He _____ his income by taking a second job.
3. I enjoy outdoor _____, like hiking and riding.
4. The documentary concerns a woman who goes to China as a missionary.
5. It is not the case that a good life is one in which people must be constantly engaged in the active _____ of goals.
6. Games find their way onto every new platform, whether it's mobile, virtual reality, or _____ reality.
7. This task is designed to test children's _____ awareness (= their understanding of where things are in relation to other things).

[Answer Key](#)

4. Systems thinking



“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”.

– Steve Jobs

Systems thinking can be described as the ability to see how things are interrelated and form a larger “whole”. Some people seem to be able to perceive such links more easily than others, to “connect the dots” and understand that if one thing is changed, the whole system will change.

There are a number of different principles for a ‘systems thinking approach’; some of which are interdependence of objects, holism (emergent properties not possible to detect by analysis but possible to define by a holistic approach) and hierarchy (complex wholes are made up of smaller subsystems).

A foundational aspect of systems thinking is the synthesis of several elements into one, which transcends the significance of the sum of the two independent elements.

Systems thinking is closely related to aesthetic thinking, as mentioned above, in that synthesis and making things “whole” and perfect, somehow is related to elegance and beauty. It is also closely related to the next type of thinking — inspirational thinking.

□ Phrases & Vocabulary

interrelated

interdependence of objects

ability to perceive such links

independence

closely related

feel a little guilty

it seemed obvious

transcend[formal]: go beyond, surpass,
excel

inter- [prefix]

used to form words meaning between or among groups of people, things, or places

International

Inter-staff communication

intra- [prefix]

used to form adjectives meaning "within" (the stated place or group)

intra-EU trade

intra-family disputes

perceive

to see something or someone, or to notice something that is obvious

Synonyms:

Think of, recognize, become aware of

guilty

If you feel guilty, you feel that you have done something wrong

easy to see, recognize, or understand

These are words for something you want to do or achieve.

Obvious is one of the most common words to describe things that are easy to see, recognize, or understand.

- It's obvious that she's upset.
- The answer is obvious.
- They're moving, so for obvious reasons they will need extra boxes.

Clear , apparent, and plain are common alternatives to obvious.

- It was clear that he was unhappy.
- Her joy was apparent to everyone.
- His disappointment was plain to see.

A more formal way of saying obvious is by using the words evident or manifest. Manifest is used in more formal contexts than evident.

- The company president was impressed by her evident ambition.
- His manifest lack of interest has provoked severe criticism.

An obvious change can be described as **marked**.

- There has been a marked improvement in his behavior.

If someone or something is very different from everything or everyone else and attracts attention or notice in a way that is not wanted, you can describe them as **conspicuous**.

- I felt very conspicuous in a suit when everyone else was in jeans.

When something is very obvious and bad, you can describe it as **blatant** or **glaring**.

- It was a blatant attempt to gain publicity.
- They made some glaring errors.

□ Exercise 5

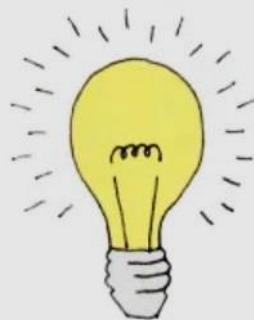
Fill in the blanks with the words below. Some word forms may need to be changed.

interrelated interdependent transcend
perceive

1. In an _____ system, each part relies on others for survival, while in an _____ system, parts have connections but may not be mutually reliant for survival.
2. As humans, our five senses are basic ways through which we _____ the world.
3. The game, published by Electronic Arts, seems to _____ conventional genre classification.

[Answer Key](#)

5. Inspirational thinking



"I was living in a little flat at the top of a house and I had a piano by my bed. I woke up one morning with a tune in my head and I thought, 'Hey, I don't know this tune — or do I?' It was like a jazz melody. My dad used to know a lot of old jazz tunes; I thought maybe I'd just remembered it from the past. I went to the piano and found the chords to it, made sure I remembered it and then hawked it round to all my friends, asking what it was: 'Do you know this? It's a good little tune, but I couldn't have written it because I dreamt it'.

– Paul McCartney recounting how he wrote the song “Yesterday” in early 1964

This type of creative thinking concerns the perception of receiving insights from somewhere or someone else. It often happens in dreams or other states, but sometimes in extremely powerful, rapid bursts of clarity and focus, known as light-bulb moments or peak experiences.

Some researchers call these breakthrough insights higher creativity. Compared to normal creative outputs, these seem to take a quantum leap beyond what can be achieved with other types of thinking. These extraordinary experiences, when everything seems to make sense in one instant moment, have been called poetic imagination, revelation and sometimes channelling. The last word indicates the belief that someone else is involved and the person with the breakthrough insight is simply a medium for the collective unconscious or a higher spirit.

Inspirational thoughts are something valuable, which needs to be noticed, recorded and put to use. This is clearly illustrated in the example of Paul McCartney above. He had a piano next to his bed, immediately found the chords, but also asked his friends for feedback. Countless personal experiences of this kind have been reported, but they are hard to measure with scientific rigour, as they are very difficult to generate at will.

• • •

□ Phrases & Vocabulary

hawk sth around to sb/sth

recounting

bursts of clarity

breakthrough insights

take a quantum leap

poetic imagination/revelation/channeling

scientific rigor

generate at will

perception: noun of perceive

light-bulb moment: a sudden realization, insight, or inspiration

peak experience: awe-inspiring moment

hawk

- a type of large bird that catches small birds and animals for food
- to sell goods informally in public places
- someone who believes that the government should take strong action in controlling the national budget, inflation, etc.
- to try to interest a person or company in a product, idea, etc.

hawk sth around to sb/sth

to try to sell or promote something (like a product, idea, or news) to various people or companies, often by going from place to place and actively seeking out potential buyers or supporters.

recount [formal, describe]

- to describe how something happened, or to tell a story
- to count something again

breakthrough

a sudden advance especially in knowledge or technique

leap

- to make a large jump or sudden movement, usually from one place to another
- to provide help, protection, etc. very quickly
- to achieve something suddenly, usually fame, power, or importance
- If your heart leaps, you have a sudden, strong feeling of pleasure or fear
- a big change, increase, or improvement
a leap in costs/profits/sales
a 20%/40%/75%, etc. leap

quantum leap

a very large improvement or development in something
a quantum leap in sth

rigor

- [severity] the fact that people are made to follow rules in a very severe way
- [care] the quality of being detailed, careful, and complete
- high standards

scientific rigor

the strict and thorough application of the scientific method to ensure unbiased, well-controlled, and transparent research, leading to robust and reproducible findings

□ Exercise 6

Fill in the blanks with the words below. Some word forms may need to be changed.

hawk(x2) breakthrough recount

leap(x3) rigor

1. She was _____ flowers at the parking lot exit.
2. He _____ his adventures since he had left home.
3. The software designer should report a near 40% _____ in profits to around £124m.
4. He _____ to fame after his appearance in a Broadway play.
5. He has written a guide to finances which he plans to _____ around to all the major publishers.
6. The new drug is a quantum _____ in the fight against cancer.
7. A major _____ in negotiations has been achieved.
8. They conducted the experiments with scientific _____.

[Answer Key](#)

1 [back to exercise](#)

1. concept
2. literature
3. nuanced-shifts
4. concept
5. account
6. literature
7. account-dent

2 [back to exercise](#)

1. converged
2. proposed-affordable
3. diverge-converge
4. approaches
5. divergent
6. propose
7. on
8. in/into

3 [back to exercise](#)

1. name
2. limitations-rely
3. extreme-considered
4. sequential
5. come up with
6. distinguish
7. break out

4 [back to exercise](#)

1. concern
2. augmented
3. pursuits
4. concerns
5. pursuit
6. augmented
7. spatial

5 [back to exercise](#)

1. interdependent-interrelated
2. perceive
3. transcend

6 [back to exercise](#)

1. hawking
2. recounted
3. leap
4. leapt
5. hawk
6. leap
7. breakthrough
8. rigor

Sources

Cambridge, Oxford, Merriam-Webster, Collins
Dictionaries
Ludwig.guru
Thesaurus.com

CS50x Iran

Harvard's Computer Science 50x Iran

