Developing Logical Thinking, Memory, and Imagination

Content	Theoretical Knowledge	Skills	Competencies
Memory & Imagination *Logical Thinking*	*- What is memory?* *- Why is it important to develop your memory?* *- Fundamental types of memory* *- Understand imagination* *- Keys to better memory* *- What is logical thinking* *- Fundamental types of logical thinking* *- How to develop your logical thinking*	*- Using imagination* *- Creating mnemonics* *- Information elaboration* *- Distinguishing facts from opinions* *- Distinguishing true and false statements* *- Emotion identification* *- Inference analysis*	*- Analysing information* *- Asking questions* *- Critical Thinking* *- Analytical Reasoning* *- Emotional Intelligence*

Introduction

Two of the most important skills in the 21st century include learning to learn, and learning to take different perspectives in order to find healthy solutions to both conflicts and problems in general. This is where memory, imagination, and logical thinking come into play, as some of the most valuable tools for every successful professional to cultivate right now. This module offers a collection of theoretical concepts and practical tools designed to enrich your teaching experience as well as your personal learning journey.

Topic 1 | Memory

What is Memory?

According to the Oxford Dictionary, memory is "the power of the mind to remember things." Put this way, memory seems to be occupied with something fairly ... "simple."

That said, did you know that there are potentially 256 types of memory?

At least, that's what the psychologist Elden Tulving put forth as a hypothesis, based on his research endeavours on memory. This is not to say that we are going to spend all the virtual ink at hand explaining all possible types and variations of memory, but to point out the following:

- ✓ Different types of memory follow different (albeit sometimes similar) processes
- ✓ As educators, we need to understand those processes in order to construct our learning experiences, such that we maximize the learning gains for our learners

Why is it important to develop and maintain your memory?

Research suggests that memory training can:

- Help you to be more focused and attentive to everyday tasks.
- Have a positive effect on your mood and emotional state
- Offset and counterbalance age-related cognitive decline
- Reshape the brain networks, introducing new patterns of brain activity that correspond to the training

The types of memory you need to understand

There are various memory models proposed. The one more frequently used to describe the basic structure and function of memory is **the stage model**. Richard Atkinson and Richard Shiffrin first suggested this model in 1968, and it divides memory into three stages:

- Sensory memory,
- Short-term memory
- Long-term memory.

Sensory Memory

Sensory memory is the first level of memory. Sensory information from the environment is captured and preserved for a short time, usually a little more than half a second for visual information and 3 or 4 seconds for auditory information. We actually pay attention only to a fragment of this sensory information, allowing some of it to progress to the next stage: short-term memory.

Short-Term Memory

Short-term memory, also known as active memory, represents the sensory memories that we pay attention to. It is the information that we are actively aware of or thinking about in the present moment.

Most of the information in our short-term memory is kept for approximately 20 to 30 seconds. Most of those memories fade away quickly, however, the ones that we decide to pay more attention to can continue to the next stage: long-term memory.

Long-Term Memory

Long-term memory refers to the storing and preservation of information long-term. For the most part, this information is preserved outside of our consciousness and can be retrieved into our working memory to be used when required.

Normally, some of this information is easier to access, while others may require a bit more to recall.

Working Memory

The terms "short-term memory" and "working memory" are sometimes used interchangeably. However, some researchers distinguish the two, describing short-term memory as the stage at which information is, while working memory being the processes related to utilizing, organizing and altering information present in our short-term storage. Working memory supports the processing of thoughts, articulating ideas and sequencing actions.

Working memory is not only related to new incoming information but also long-term memories that can be recalled and mixed up with new memories to construct new meaning and make further decisions.

Losing Memory

Forgetting is a pretty common event. But why do we forget? There are four basic explanations:

- Failure to store - when we don't pay enough attention to information or render it unnecessary
- Interference - when similar memories compete, causing some to be more difficult to remember or even forgotten entirely.
- Motivated forgetting - when we actively want to forget something, either consciously or unconsciously
- Retrieval failure - where the information is in long term memory, but cannot be accessed i.e. cannot be accessed because the retrieval cues are not present.

Imagination

One could argue that it is through our imagination that certain types of memory are preserved. But what is imagination? According to the author of the book "The Element" Sir Ken Robinson, imagination is the "act of bringing things into consciousness that aren't here." In a very broad way, memories fit that same description as well.

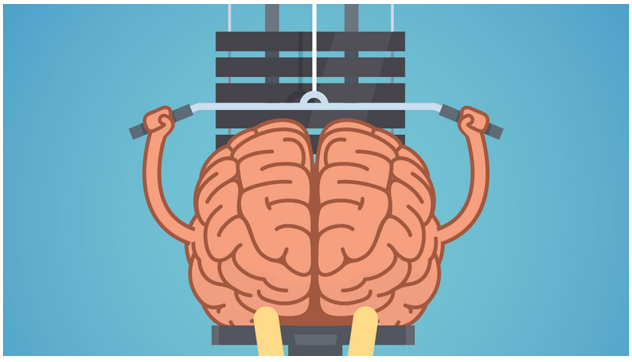
That said, there's an important distinction to be made between imagination and another element that we are to explore in greater length later on namely - creativity.

So, what is the difference between imagination and creativity? According to the multi-disciplinary design leader Tanner Christensen "Imagination allows us to think of things that aren't real or around us at any given time, creativity allows us to do something meaningful with our imaginations."

In other words, in the context of memory, imagination is a tool that we can use to craft our memories in a way that is meaningful for us. And that very process we can label as "creative."

Keys to Better Memory

The depth and attention with which we process information affects directly our ability to recall it. Here are some techniques that allow us to memorize better.



Elaborative Rehearsal

We might think of rehearsal as just repeating material over and over again until it finally sticks or we don't need it anymore, like repeating the digits of a phone number until we dial it. However, this is only one type of rehearsal, and it's known as **maintenance rehearsal** (commonly known as *"rote memorisation"*).

In contrast, elaborative rehearsal is related to connecting newfound information you're learning with information you already know.

So, by working on understanding how new and known ideas are linked or by building creative associations between pieces your brain is processing the information in greater depth.

Paraphrase

Instead of simply reading or copying information from your source, give yourself the opportunity to explain it in your own words.

This will help you gain greater insight into what you actually understand and what else may require more attention.

If you want to take this a step further, think of explaining what you are learning to:

- Someone older than you
- Someone younger than you
- Someone your age who is not acquainted with knowledge in the topic

Question

Come up with 3 to 8 questions related to each point that you are studying. Asking questions helps you better understand not only what answers the material can provide but also the answers that the material doesn't provide.

Asking questions makes you actively think and engage with the material, instead of just passively perceiving it.

Plus, you can then use these questions to test your knowledge. This is extremely valuable because self-testing is cited as one of the most effective ways to remember new information.

Analyse

In this case, by "analyse" we mean something very specific. Think about how you can compare, group, and contrast different pieces of information. This is best done, once you already have a basic grasp of the new concepts that you are studying. By performing such self-conducted analysis you are inviting your brain to spend even more time with the new information. In addition, the observations and new connections you create through your analysis will help to further facilitate pieces into your long-term memory.

Then, if you want to take this even a step further, you can put your observations into writing or put together a visual representation of them (like a presentation, a matrix, a mind map, or a table)

Use mnemonics

Mnemonic strategies can be very helpful in learning information in an efficient, well-ordered manner. The reason mnemonics work so well is because they combine a multitude of memory principles together. More elaborate systems like ***the loci method*** or ***a memory matrix*** require a bit of effort to set up at first but may be used indefinitely. The key to any quality mnemonic is developing consistency in its use.

Space out your learning

There are two major principles to remember here: (1) don't expect to learn everything in one sitting; (2) don't expect to remember anything if you don't revisit it. Based on research related to our biology, science suggests that every 90 to 120min we should take a 20min pause from learning.

Then, in order to really consolidate what you are learning long-term, make sure to revisit it. One straightforward way to do that is by following the Fibonacci sequence, where every number gets to represent the number of days you want to wait before revisiting a piece of information again (1, 2, 3, 5, 8, 13, 21, 34, 55, 89, etc...)

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Topic 2 | Logical Thinking

What is Logical Thinking?

According to the Oxford Dictionary, “reasoning” is "the action of thinking about something in a logical, sensible way." That said, logic is not something that we manifest out of thin air - we also need knowledge.

Therefore, it is on the basis of existing knowledge we are to do our best and think in a way that is logical and sensible.

Naturally, even the most elaborate, logical conclusions are at risk of being no good unless we act upon them.

In other words, reasoning is not to be a means to its own end. It is a tool to draw logical conclusions, and use those conclusions to construct explanations, make predictions, and develop plans for action.

Fundamental types of logical thinking

Deductive reasoning

Deductive reasoning is using **general ideas** to arrive at **specific conclusions** and use those as solutions.

EXAMPLE

general idea - As part of a human resources department you have identified public speaking skills as an important qualifier for a particular position.

specific conclusion - Requiring candidates to make an oral presentation on a predetermined topic as a part of their second interview. The candidate you decide to hire has to prove successful in this aspect of their work.

Inductive reasoning is using **specific ideas** to arrive at more **general conclusions** and use those as solutions.

EXAMPLE
specific idea - As a trainer, you decided to apply the flipped-classroom approach to one of your last lessons. You observe that the learners seemed more engaged throughout the session.

general conclusion - Applying the flipped-classroom approach to other lessons may get the learners to be more engaged in those lessons as well.

How to develop your logical thinking

Be attentive and ask questions
Pay attention to what people say and even more so, to what people do. Cultivate the habit of gathering and analysing data before reaching a conclusion. Assume less and ask more questions so you can have a more truthful picture of things. Ask “What do you mean,” or lead by saying “Tell me more” to facilitate a more fruitful discussion.

Break it down
If you don’t want to feel overwhelmed or miss on something important - break things down. If you want to understand a situation or someone’s point of view better, or convey your own ideas better - break things down. And if “breaking things down” was to be something broken down it would look something like this:

- Pin down what is overwhelming you and separate it from all other work/ideas
- Break it down into smaller tasks (or questions you’d need answers to)
- Sequence those smaller pieces into a logical, workable order
- Identify the actual next step (literally, the next thing to do, today or right now)
- Start checking off your tasks or questions as you get them done (or answered)

Think out loud
Ask an acquaintance (a colleague, a manager, a partner) if you can run through some scenarios together. There’s always the possibility that others will make a statement or ask a question you didn't think of. Also, the very act of articulating things out loud may be more than enough to understand your thoughts and ideas better.

Be aware of your surroundings
Inductive reasoning is grounded in your ability to notice patterns and trends. Keep in mind that pattern recognition is not limited to visual objects (like geometrical shapes).

You need to start observing the world around you.

What habits of your colleagues can you observe? What about those of your manager? What tendencies do you notice when people interact with each other? What about work tendencies? What are some typical situations that you find yourself in during a project? Have you noticed the patterns of actions that different tasks require?

Here's an outline of the steps to develop your pattern recognition abilities:

- Look for the processes leading up to a given result.
- Break those processes down into their component steps
- Study those components to understand how you can change them
- Make a decision on what you'd like to change and give it a go
- Observe and analyse the results
- Repeat

Learn to notice those "little things" about you, about others, and about work. They can serve you to put together bigger solutions.

Start predicting outcomes
When you begin to recognize patterns, take it a step further and see if you can forecast the outcome. Keep a record of your observations and predictions - those can then become the grounds for your further plans.

Learn other perspectives
Being attentive to other people's thinking is vital in reasoning. This is why perspective-taking becomes an increasingly valuable skill. Perspective-taking may also serve you to grasp what others may not understand about your own thinking. In doing so, you can better understand the limitations of both your own thoughts, as well as those of others - allowing you to reach even better solutions. So, train yourself to perceive situations or understand concepts from alternative points of view, such as those of other individuals.

Improve your memory
Invest in brain-training activities that focus on memory retention and recall. Remember to also test yourself periodically, by revisiting material, having a conversation on the given topic, or trying to put together a piece of content for the web (for example an article).

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Test and Evaluation

1. According to the *stage model*, what are the 3 core types of memory?
    a) Sensory memory, slow-term memory, long-term memory
    b) Sensitive memory, slow-term memory, long-term memory
    c) Sensory memory, short-term memory, long-term memory
    d) Sensory memory, slow-term memory, long-term memory

2. We tend not to remember things if:
    a) We don't pay enough attention to information
    b) We render information unnecessary to remember
    c) We are trying to memorise similar things
    d) We actively want to forget something
    e) We cannot retrieve a piece of information from long-term memory
    f) All of the above

3. Rehearsal is:
    a) Useful when the learner elaborates on the information
    b) Useless when the learner elaborates on the information
    c) Useful when the learner memorises the information by rote repetition
    d) Useless when the learner memorises the information by rote repetition
    e) All of the above

4. Memory & Imagination are not linked:
    - True
    - False

5. Creativity and imagination represent the same thing:
    - True
    - False

6. According to the material, imagination:
    a) Allows us to bring things into consciousness that aren't here.
    b) Allows us to bring things into consciousness that aren't real.
    c) Allows us to bring things into consciousness that are around us.
    d) Allows us to craft our memories into something meaningful.
    e) All of the above

7. Deductive reasoning is using **general ideas** to arrive at **specific conclusions**.
    - True
    - False

8. Inductive reasoning is using **general ideas** to arrive at **specific conclusions**.
    - True
    - False

9. Asking questions is a strategy to develop:
    a) Memory
    b) Imagination
    c) Logical thinking
    d) All of the above

10. Training your memory may affect your logical thinking positively:
    - True
    - False

SELF-ASSESSMENT QUESTIONNAIRE

1. What are some practices similar to elaborative rehearsal that you have previously followed?

2. Which of the described ways for memory training appeals to you the most?

3. After getting familiar with the theory and the accompanying activities:
    - Which logical thinking activity appeals to you the most?

    - Which memory training activity appeals to you the most?

4. What are some logical thinking habits that you can see yourself adopting and using?

5.1 From the accompanying memory activities, if you were to make a top three of the ones you are to use the most, what would those 3 be?

- Which one would be your number 1?

- Which one would be your number 2?

- Which one would be your number 3?

5.2 In what context (or for what subject) do you imagine yourself using them the most?

Correct answers to the quiz:

1) c
2) f
3) a, d
4) False
5) False
6) a, b, d
7) True
8) False
9) d
10) True

Sources & Additional Materials

- H.L. Roediger III, F.M. Zaromb and M.K. Goode, 1.02, edited by John H. Byrne, Academic Press, Oxford, 2008, Pages 11–24.
  A Typology of Memory Terms, In Learning and Memory: A Comprehensive Reference,

- Tulving, E., 1972.In: Tulving, E., Donaldson, W. (Eds.), Organization of Memory. Academic Press, New York, pp. 381–403.
  Episodic and semantic memory.

- Stangor C, Walinga J. 9. 1, Published online October 17, 2014.
  Memories as types and stages

- Camina E, Güell F., Frontiersin.org, 2017
  The neuroanatomical, neurophysiological and psychological basis of memory: current models and their origins. Front Pharmacol.

- Queensland Brain Institute. 20 November 2019
  Types of memory

- Christensen T (2016), https://creativesomething.net/. (Accessed 26.01.2022)
  Imagination is not creativity

- Indeed Editorial Team (2021), (Accessed 26.01.2022)
  What Is Inductive Reasoning? (Plus Examples of How to Use It)

- Indeed Editorial Team (2021), (Accessed 26.01.2022)
  Deductive Reasoning: Definition and Examples

- Changing Minds (2021), (Accessed 26.01.2022)
  Types of Reasoning

- Ashworth H (2021), wikijob.co.uk., (Accessed 26.01.2022)
  Deductive, Inductive and Abductive Reasoning in the Workplace