

# Data presentation (How to prepare PowerPoint slides)

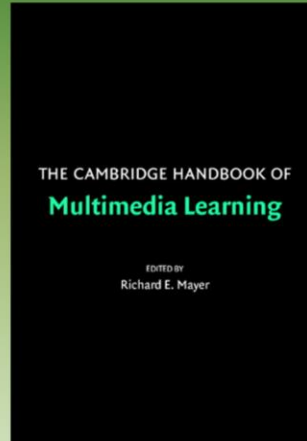
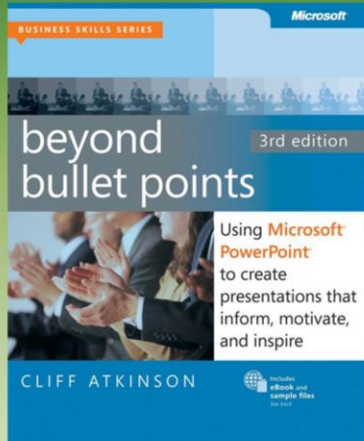


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and Informatics

Introduction

## This presentation is based on two books



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Cliff Atkinson: beyond bullet points and The Cambridge Handbook of Multimedia Learning. (Excerpts can be found in Google Books.)

## ... and three websites (1)

### About.com Psychology

Psychology Basics Theories Experiments

#### Memory

An Overview of Memory

By [Kendra Cherry](#), About.com Guide

See More About: [memory](#) [clusters](#) [long-term memory](#) [short-term memory](#)

Have you ever wondered how you manage to remember information for a test? The ability to create new memories, store them for periods of time and recall them when they are needed allows us to learn and interact with the world around us. The study of human memory has been a subject of science and philosophy for thousands of years and has become one of the major topics of interest within [cognitive psychology](#). But what exactly is memory? How are memories formed? The following overview offers a brief look at what memory is, how it works and how it is organized.



**Ads**

**Do You Understand Others?**  
Master Cultural/Social Skills w/a  
Master Degree in Applied Psychology  
[EducationDegreeSource.com/Online](#)

**What is Memory?**

Memory refers to the processes that are used to

Memory involves encoding, storing and retrieving information.  
*Photo by Kiyoshi Takahase Segunda/iStockPhoto*

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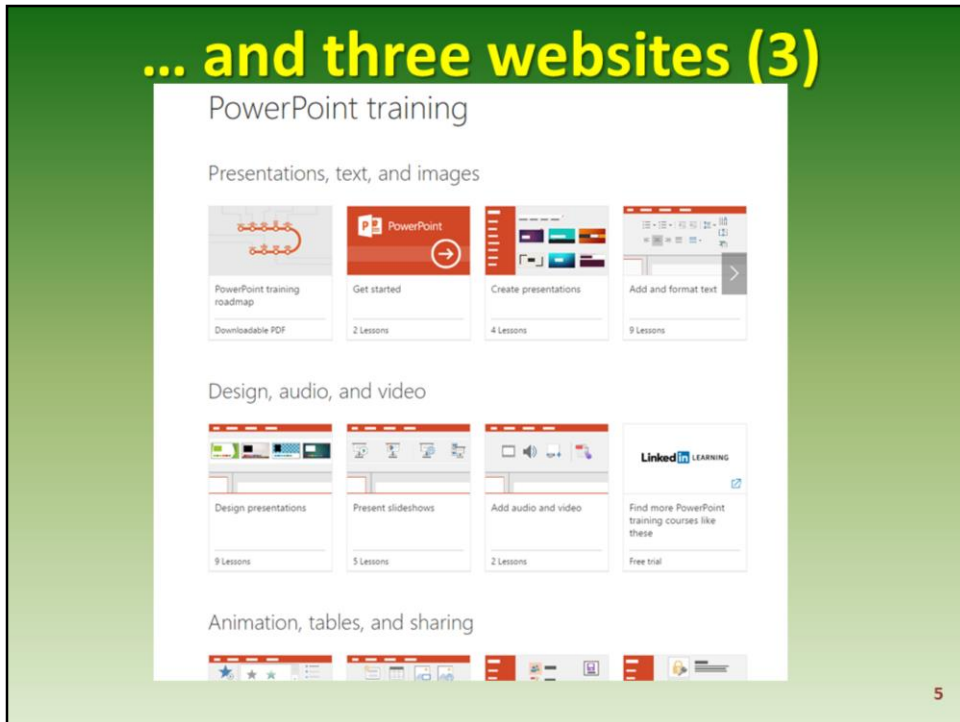
About.com: Psychology

## ... and three websites (2)



This is the website of the writer of the earlier mentioned book.


## ... and three websites (3)



This is the website of Microsoft Office training center of PowerPoint.

<https://support.office.com/en-us/article/PowerPoint-training-40e8c930-cb0b-40d8-82c4-bd53d3398787>

# The secret of good presentation



One slide, one thought.

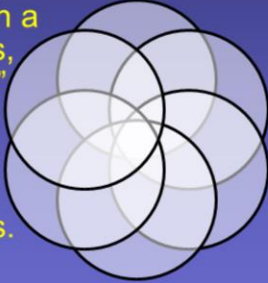
„A picture is worth a thousand words, possibly more.”

Use illustrations.

Emphasize the essence.

Forget bullet points.

Reading text ruins a presentation.



Top tips on how to make presentations on the Internet.  
Is there any scientific research behind these tips?

## In this lesson we will

review key research principles

learn how to use them in presentation

compare slides made according to new and conventional approaches

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In this lesson we will review key research principles that every presenter needs to know, learn how to use the research principles to make a good presentation, compare slides using the new and the conventional approaches.

## Presentation = communication



During a presentation, we send information and the audience receive it. Here the memory of an audience member is the critical human element, that determines how well new information is received, processed, and stored in the human mind.



## Theory and research related to presentations

How we process information

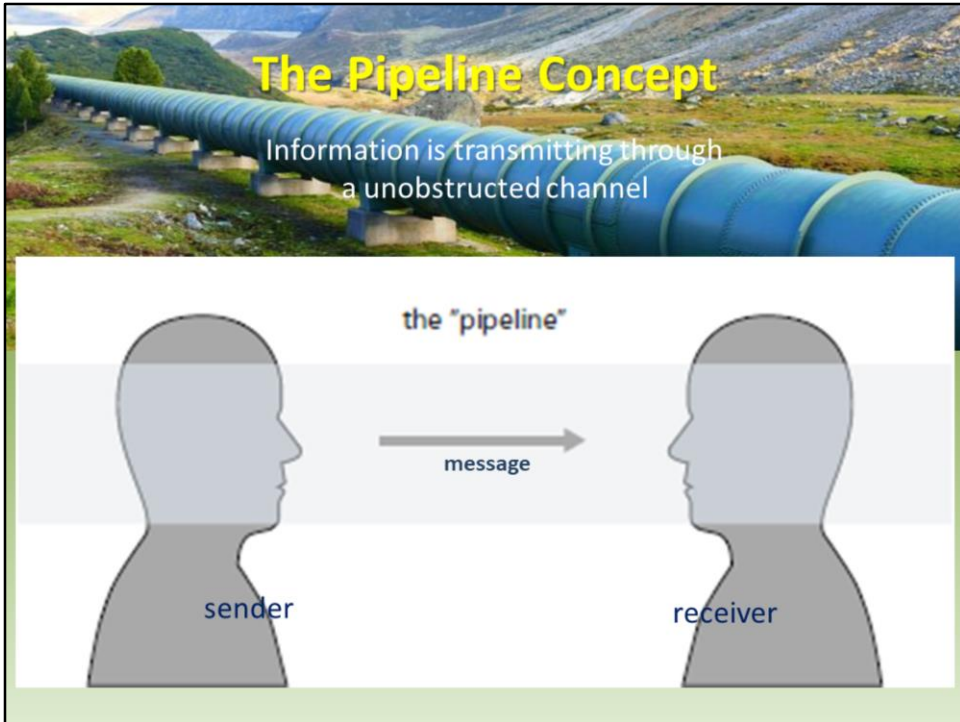
The concept of dual channels

Guiding attention

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Cognitive scientists have discovered three important features of the human information processing system that are particularly relevant for PowerPoint users:

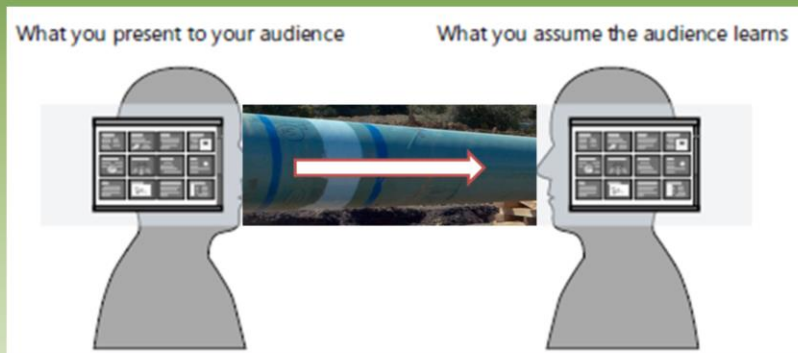
1. *Limited capacity of* information processing.
2. People have separate information processing channels for visual material and verbal material.
3. People understand the presenter when they pay attention to the relevant material.



In communication terms, a “sender” transmits a “message” to a “receiver”. You might assume that you “send” information through an unobstructed channel, like a pipeline, and the audience will “get it” at the other end of the pipeline.

## The Pipeline Concept:

You assume that the receivers will get all of the presentation



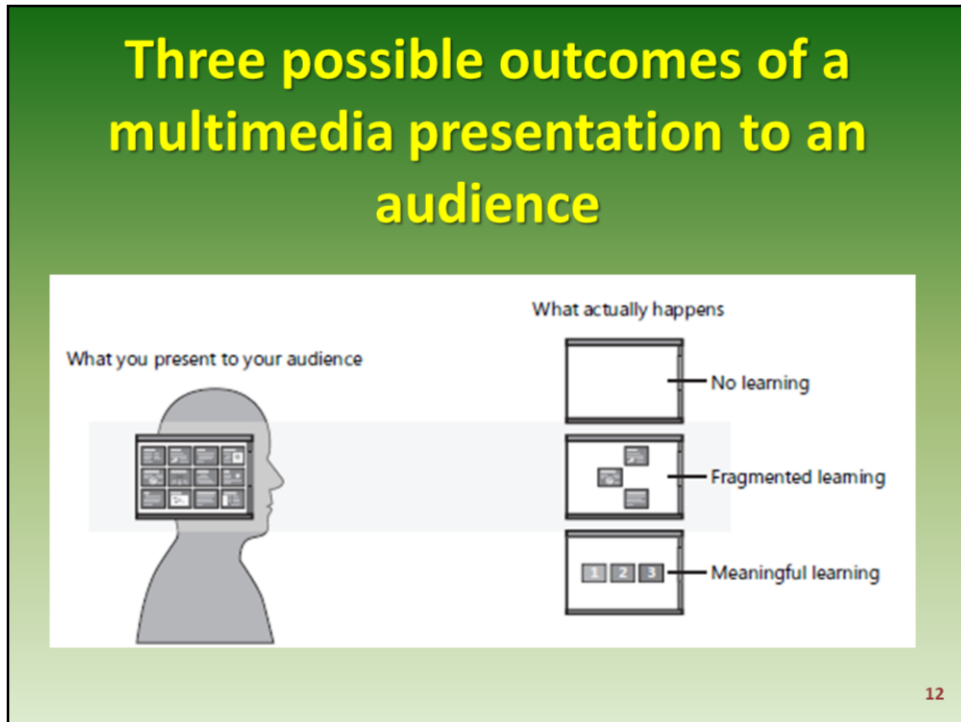
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With the pipeline in mind, you assume that you can produce a presentation in whatever way you like.

After you send this presentation through the pipeline, you assume that receivers will “get it” on the other side, as shown on the right.

If the audience didn't get what you delivered, of course, it's not your fault as a presenter, you delivered the PowerPoint presentation, and what they did with it is their problem, not yours.

## Three possible outcomes of a multimedia presentation to an audience



Although the pipeline metaphor is convenient, in practice it does not deliver what you might assume.

If you give a multimedia presentation to an audience, there are three possible outcomes:

1. The first possible outcome is that your audience experienced *no learning*. *This is the worst case.*
2. The second possible outcome is that your audience experienced *fragmented learning*. The fragments could be *any pieces of* information among many, and you don't know which ones.
3. The third possible outcome is that the audience remembered exactly what the presenter intended — they experienced *meaningful learning*.

# The human memory

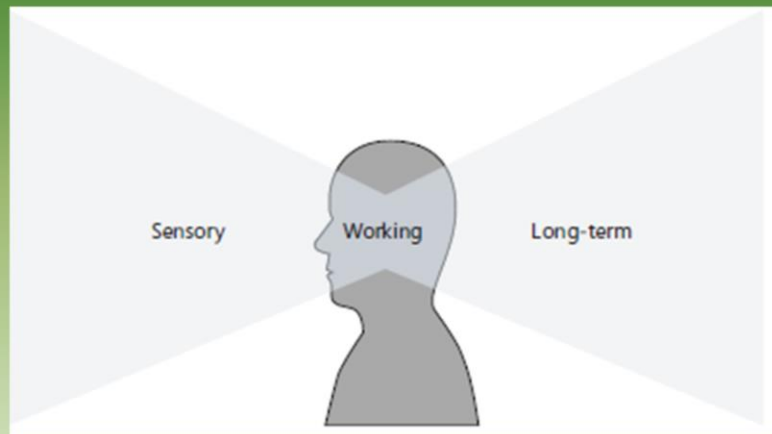


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During a presentation, the memory of an audience member that determines how well new information stored in the human mind.

Memory refers to the **processes** that are used to acquire, store, retain and later retrieve information.

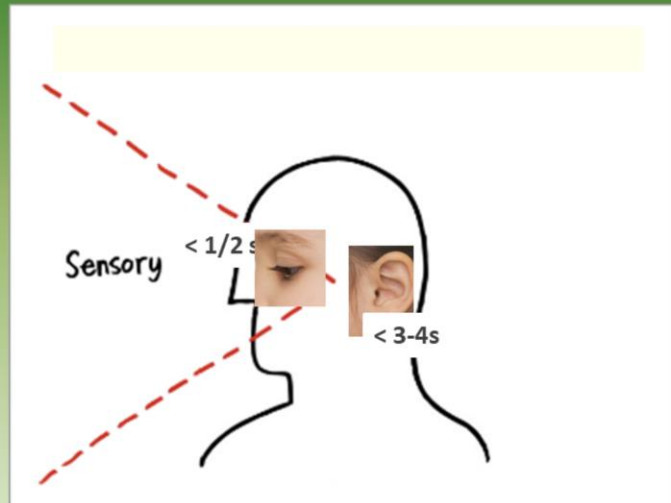
## Three type of human memory



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Researchers who study the mind generally accept that there are three types of human memory.

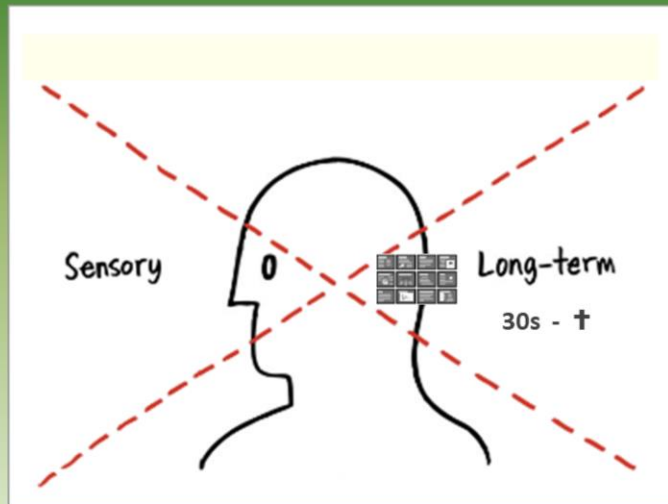
# Sensory Memory



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**Sensory memory** is the part of the mind where the initial impressions of sights and sounds are briefly store, generally for no longer than a half-second for visual information and 3 or 4 seconds for auditory information. Sensory memory is potentially unlimited in its capacity.

# Long-term memory

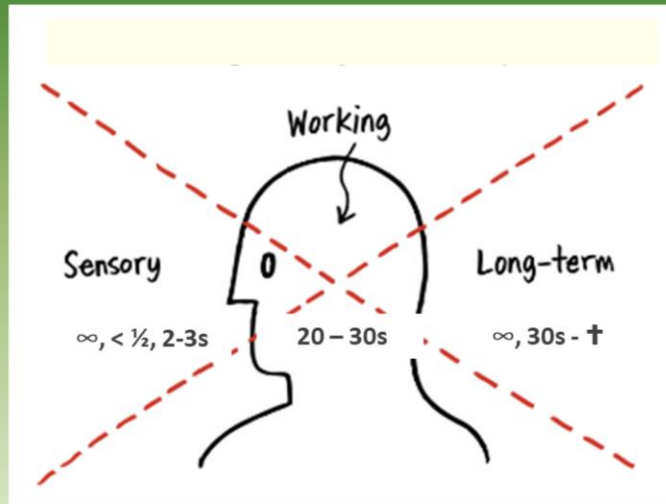


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**Long-term memory** is the part of the mind where your audience members store information over an extended period of time, from 30 seconds to lifetime. If information does not find its way into long term memory, it is lost. Long-term memory is potentially unlimited in its capacity.



# Working memory



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**The working memory (sometimes called short-term memory)** is the part of the mind where your audience members hold their attention, essentially, working memory is a temporary holding area for information.

As sensory memory briefly holds sights or sounds, working memory then pays attention to some of them and holds them for a approximately 20 to 30 seconds while it works to integrate them into long-term memory.

## Memory test

Nine	Swap	Cell	Ring	Lust
Plugs	Lamp	Apple	Table	Sway
Army				Worm
Clock	Horse	Color	Baby	Sword
Desk	Hold	Find	Bird	Rock

Write down as many words from the list as you can.

**How many words did you get correct?**

Let's make an experiment.

In the following demonstration, look at the list of words for 1/2 minute. Memorize as many words as you can in this amount of time.

Write down as many words from the list as you can.

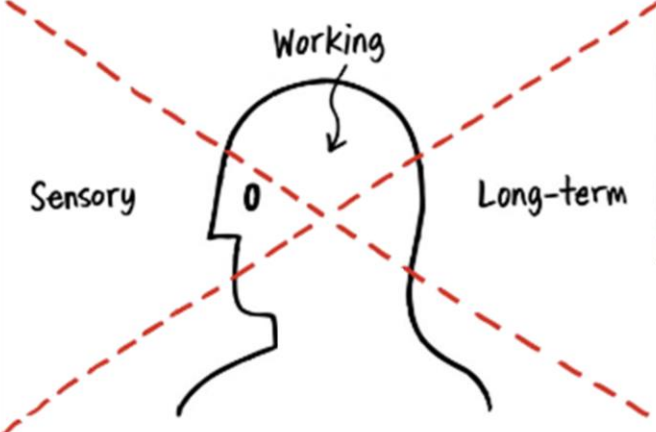
How many words did you get correct?

Despite having time to memorize the words, you may find it surprisingly difficult to later recall even a handful of the words. This experiment demonstrates some of the limitations of working memory.


# The capacity of working memory

George Miller: The Magical Number Seven, Plus or Minus Two (1956)

..but working memory is extremely limited



The diagram shows a profile of a human head with three memory systems labeled: 'Sensory' on the left, 'Working' at the top with an arrow pointing to the brain, and 'Long-term' on the right. Two red dashed lines cross the entire diagram from top-left to bottom-right and bottom-left to top-right, forming an 'X' shape.



A black and white photograph of George Miller, a man with glasses, wearing a suit and tie, standing in front of a whiteboard.

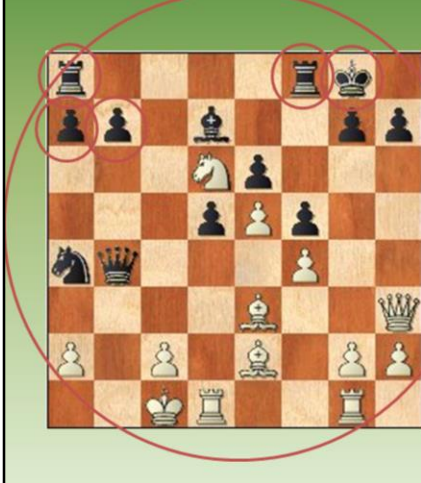
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The amount of information that can be stored in working memory can vary. In an influential paper titled "The Magical Number Seven, Plus or Minus Two," the psychologist George Miller suggested that people can store between five and nine items in short-term memory. More recent research suggests that people are capable of storing approximately four **chunks** or pieces of information in short-term memory.

# Chunks

4-7-1-1-3-2-4 → 471-1324

149219842018 → 1492 1984 2018



Beginners:  
chunks = pieces

Professionals:  
chunks = chess positions

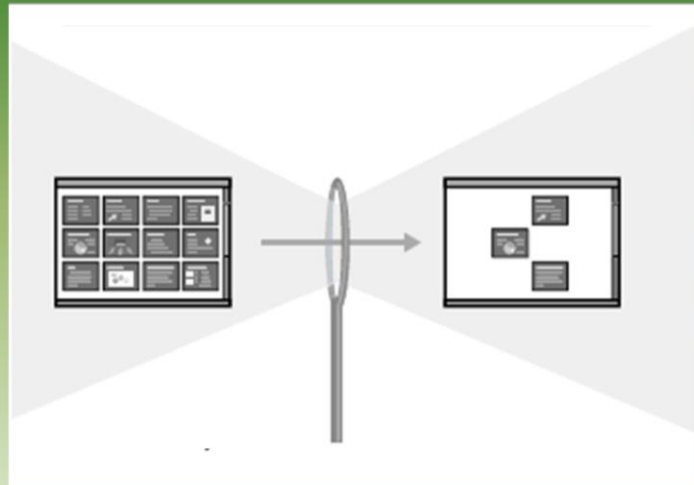
20

Chunks refers to more individual units of information grouping into larger units. By separating disparate individual elements into larger blocks, information becomes easier to retain and recall.

- ☞ A phone number sequence of 4711324 would be chunked into 471-1324.
- ☞ A number sequence can be chunked into years.
- ☞ Memorising chess positions. Here for a beginner chunks are pieces, for a good player chunks are whole chess positions.

**Benkó,P - Fischer,R: Portorozs, 1958**

## Pipeline vs. Eye of the needle



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- ~ The limited capacity of working memory to process new information put a major crimp in the pipeline metaphor.
- ~ This limit creates a narrow passage — much like the eye of a needle — that stands between the information you present sensory memory and the information integrated into long-term memory.

## Memory test

Horse	Cat	Dog	Fish	Bird
Orange	Yellow	Blue	Green	Black
Table	Write down as many words from the list as you can.			se
Teacher	School	Student	Homework	Class
Apple	Banana	Kiwi	Grape	Mango

**How many words did you get correct now?**

Let's repeat the experiment.

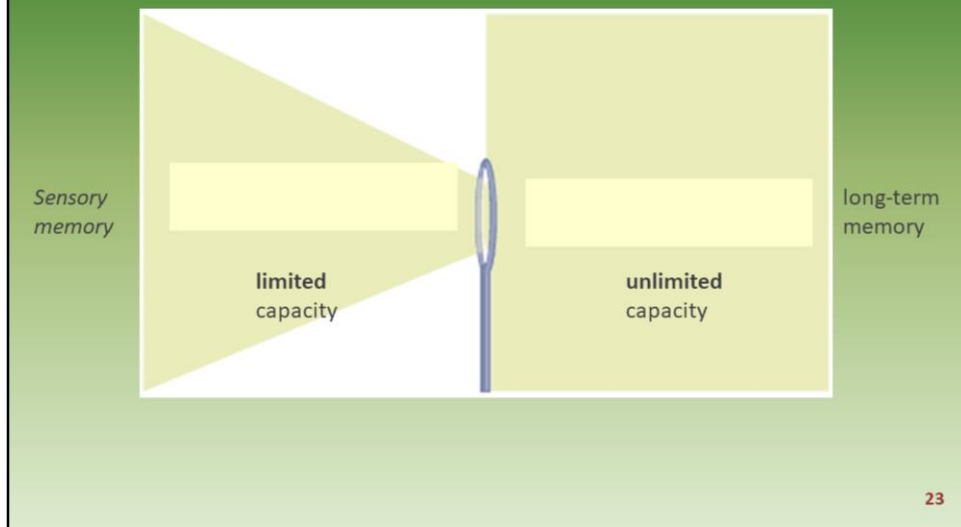
In the following demonstration, look at the list of words for ½ minute. Memorize as many words as you can in this amount of time. 🗣️

Write down as many words from the list as you can. 🗣️

🗣️How many words did you get correct now?

Because these items can be easily chunked based on category, you can probably remember far more of these words.

## Organizing information using existing schema



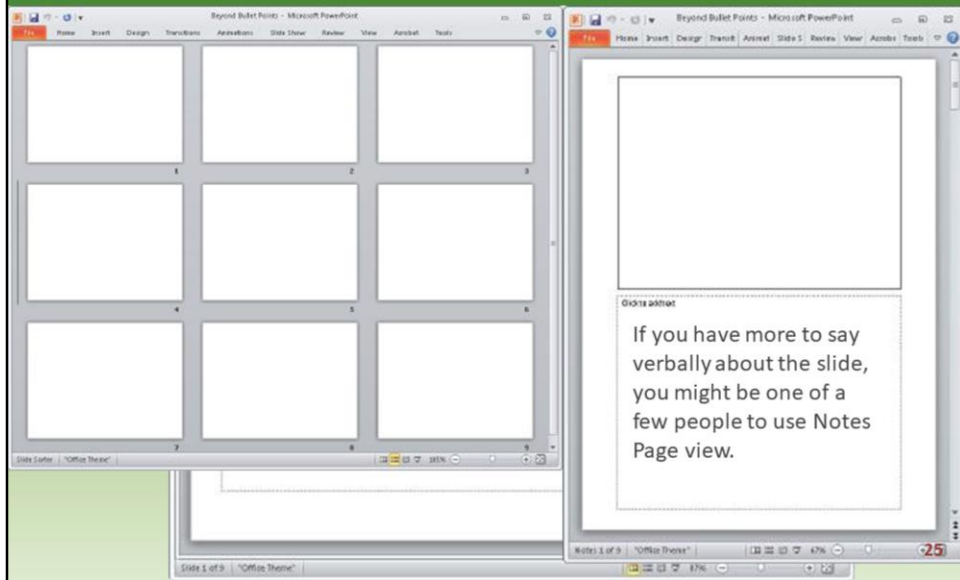
Working memory has only limited capacity to handle *new information as that information arrives from the sensory memory*. **But** it has unlimited capacity to pull in *existing information from long-term memory*.

If information is poorly organized, or if it is difficult to relate to existing schema, working memory can handle even less information.





# The three working views in PowerPoint



When you create a text slide in PowerPoint you first start in Normal view, where you click to add a title to the title area and then click to add text in the content area below.

If you have more to say verbally about the slide, you might be one of a few people to use Notes Page view.

☞ Where you see the slide area at the top and an adjacent text box in the notes area at the bottom that does not appear on screen during a presentation.

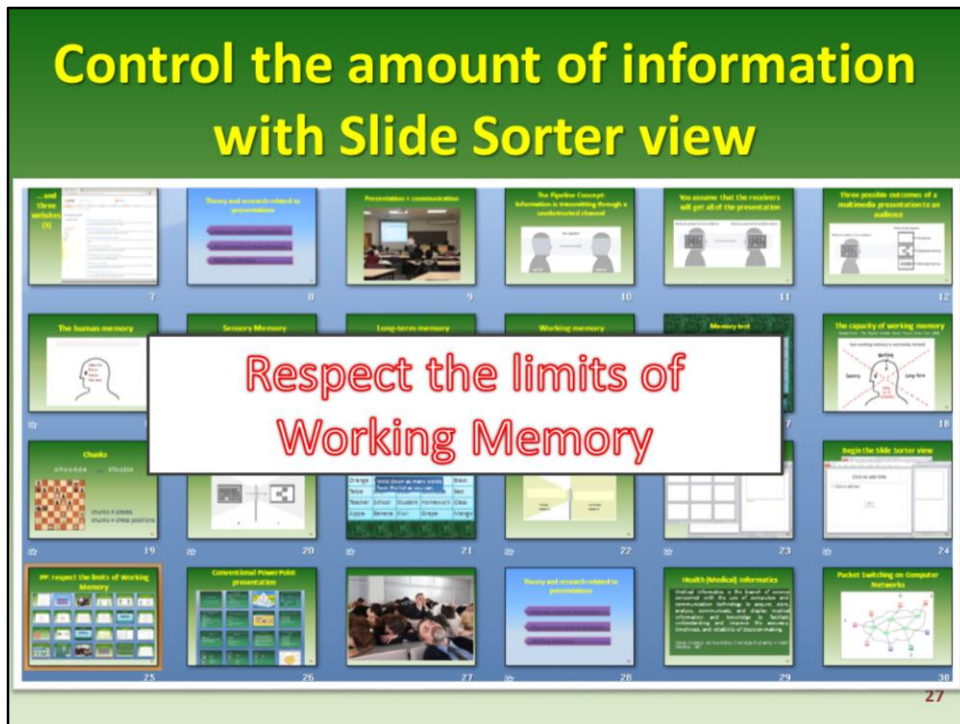
And after having created your slides, you might visit ☞ Slide Sorter view, to take a look at all of your slides together as small thumbnails.

# Begin the Slide Sorter view

The screenshot displays the Slide Sorter view of a PowerPoint presentation. On the left, a list of slide titles is shown, each preceded by a bullet point. The titles are: 'Data presentation (how to prepare PowerPoint slides)', 'László Almási', 'In this lesson we will', 'This presentation is based on two books', '...and three websites (1)', '...and three websites (2)', '...and three websites (3)', 'Theory and research related to presentations', 'Presentation = communication', 'The Pipeline Concept: Information is transmitted through an unobstructed channel', and 'Memory that'. The main area shows a grid of 16 slide thumbnails, numbered 1 through 16. Slide 1 is highlighted with a yellow border. The thumbnails contain the following titles: 1. Data presentation (how to prepare PowerPoint slides) (László Almási); 2. In this lesson we will; 3. This presentation is based on two books; 4. ... and three websites (1); 5. ... and three websites (2); 6. ... and three websites (3); 7. Theory and research related to presentations; 8. Presentation = communication; 9. The Pipeline Concept: Information is transmitted through an unobstructed channel; 10. You assume that the receivers will get all of the presentation; 11. Three possible outcomes of a multimedia presentation to an audience; 12. The human memory; 13. Three types of human memory; 14. Sensory Memory; 15. Long-term memory; 16. Working memory; 17. Memory that; 18. The capacity of working memory; 19. Chunking; 20. Pipeline vs. Eye of the needle.

You are suggested to flip this sequence and always work in Slide Sorter view first, then in Notes Page view, and finally in Normal view.

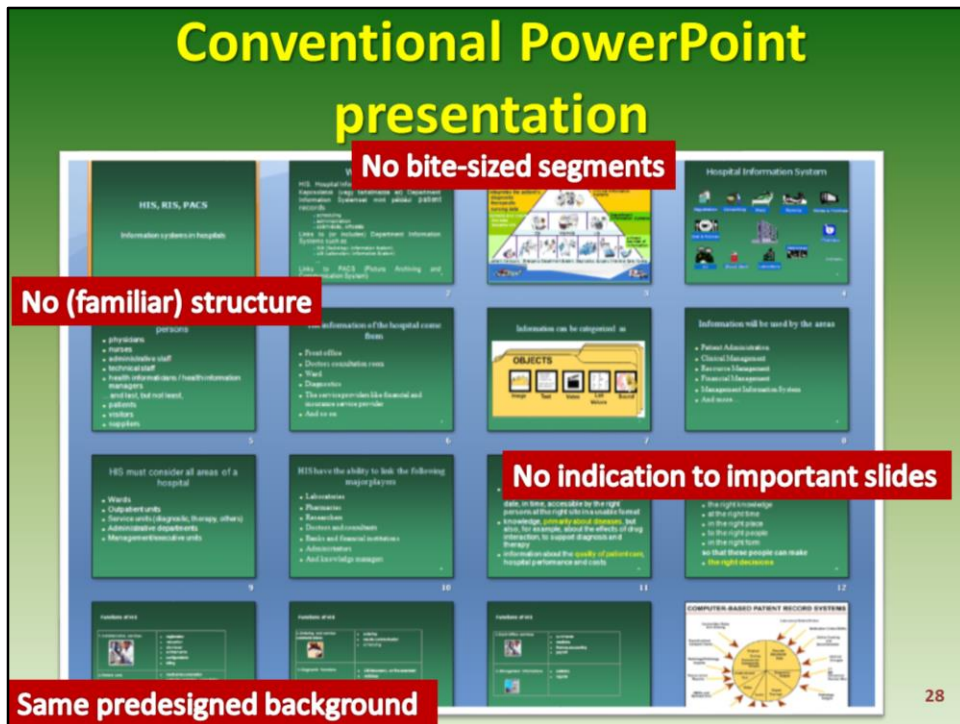
With new slides, write the titles in Word, then open it in PowerPoint and use the Slide Sorter view.



According to the **Segmentation Principle** of multimedia learning theory, people comprehend better when information is presented in small chunks or segments. Using Slide Sorter view, you can see the **logical flow of your presentation** . In this view, you may decide to **break up one slide into two or three** slides to avoid information overload.

Every slide contains only one main idea that is clearly summarized by a headline. This eases your audience through your story and explanation frame by frame, one piece at a time.

1. Information is presented in bite-sized segments, with one idea per slide.
2. A familiar motif relates new information to existing information in long-term memory.
3. There is clear guidance to help the viewer build a coherent structure.
4. Slide layouts and backgrounds call attention to the most important slides first.



Information is not presented in diggestable segments.  
 The slides do not help introduce new information with a familiar structure.  
 There are no visible signals to indicate which slides are most important.

What you see here is visual overwhelm rather than visual organization.

Using the same predesigned background for all of the slides gives them a uniform look, but it also prevents you to visually highlight the most important information on single slides or across slides. It also makes the overall presentation appear visually repetitive, which causes boredom that quickly shuts down attention.



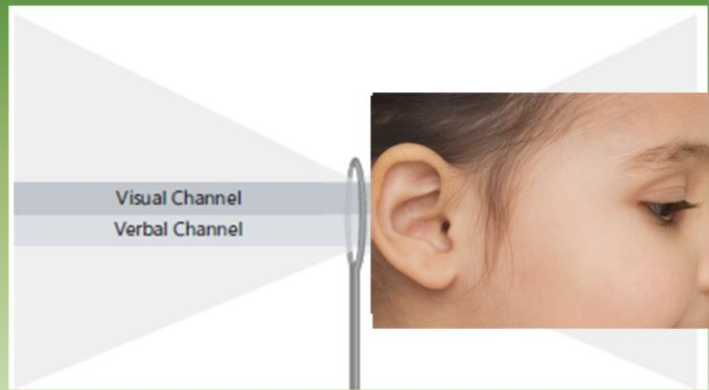
## Theory and research related to presentations

How we process information

The concept of dual channels

Guiding attention

## Multiple channels in working memory

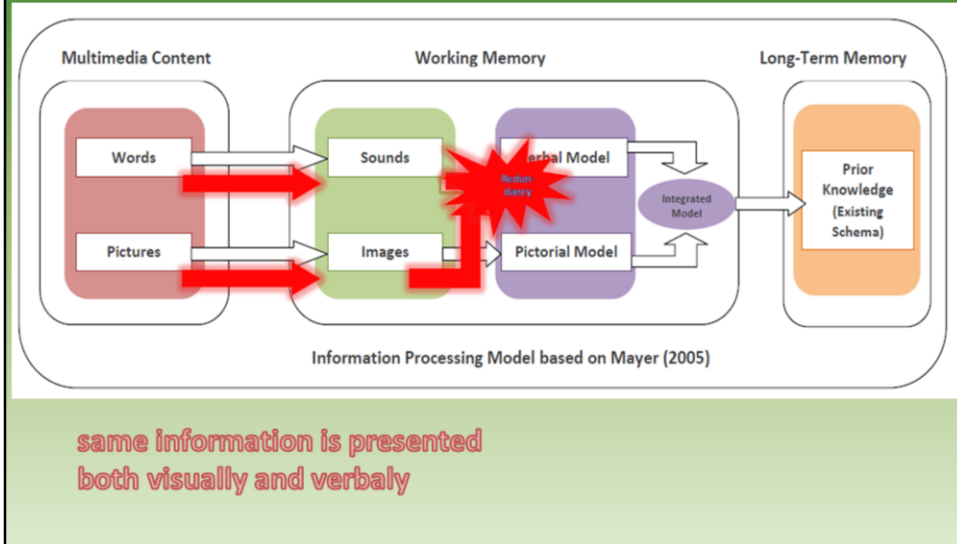


Researchers now believe that there are multiple channels in working memory, a verbal and a visual channel.

The verbal channel handles information that is heard, while the visual channel processes information that is seen.

*Using both the visual and auditory channels, working memory can handle more information overall.*

## Risk of cognitive overload, redundancy



Although text on a screen is a visual element, working memory quickly verbalizes the words and sends them through the verbal channel. Redundancy happens when the same information is presented both visually and verbally because the same information is entering through two channels and the mind has to exert more effort to reconcile them.



## Mayer experiments to explore the redundancy effect

two multimedia presentations

same material  
**both** narrated and  
displayed with text  
on the screen



only narration  
with the text on  
the screen  
removed



retained 28 percent more information

33

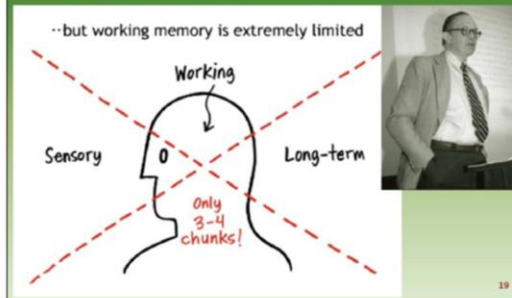
To explore the redundancy effect, Mayer conducted experiments using two multimedia presentations. The first included the same material both narrated and displayed with text on the screen, and the second included the narration with the text on the screen removed. Audiences who experienced the second presentation retained 28 percent more information than those who experienced the first presentation.



# Use Notes Page View to synchronize what you show and say

## The capacity of working memory

George Miller: The Magical Number Seven, Plus or Minus Two (1956)



The amount of information that can be stored in working memory can vary. In an influential paper titled "The Magical Number Seven, Plus or Minus Two," the psychologist George Miller suggested that people can store between five and nine items in short-term memory. More recent research suggests that people are capable of storing approximately four **chunks** or pieces of information in short-term memory.

plan for visuals  
in the slide area

spoken words in the  
off-screen text box below

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The fundamental principle behind multimedia learning is: people learn better from words and pictures than from words alone. In this context, words include written and spoken text, and pictures include static graphic images, animation and video.

**Plan for visuals in the slide area and.**

## Narration and text rely on the same channel

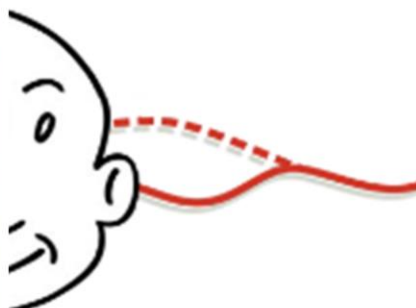

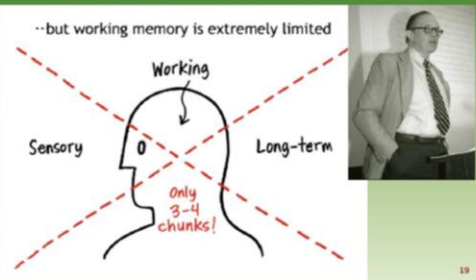
Redundancy happens when information is presented both visually and verbally. The same information is entered into two channels and the mind has to expend extra effort to reconcile them. This reduces the amount of information that can be stored in working memory and can lead to cognitive overload that so frustrates

**Avoid displaying and narrating text!**

# Write out your narration on the Notes pages

**The capacity of working memory**  
George Miller: The Magical Number Seven, Plus or Minus Two (1956)

...but working memory is extremely limited



The amount of information that can be stored in working memory can vary. In an influential paper titled "The Magical Number Seven, Plus or Minus Two," the psychologist George Miller suggested that people can store between five and nine items in short-term memory. More recent research suggests that people are capable of storing approximately **four** chunks or pieces of information in short-term memory.

**Remember your notes page comes a handout!**

This approach (**Plan for visuals in the slide area and spoken words in the Note Page below**) also creates a well balanced handout that you print in Notes Page format (will be shown in practices).

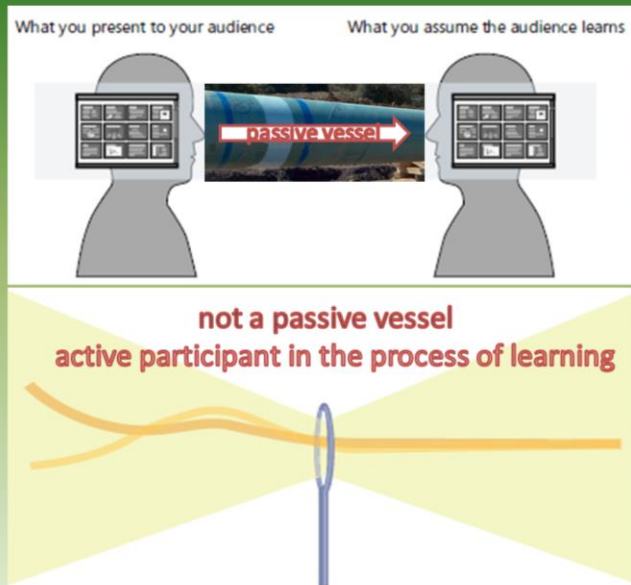
## Theory and research related to presentations

How we process information

The concept of dual channels

**Guiding attention**

## You have to guide attention



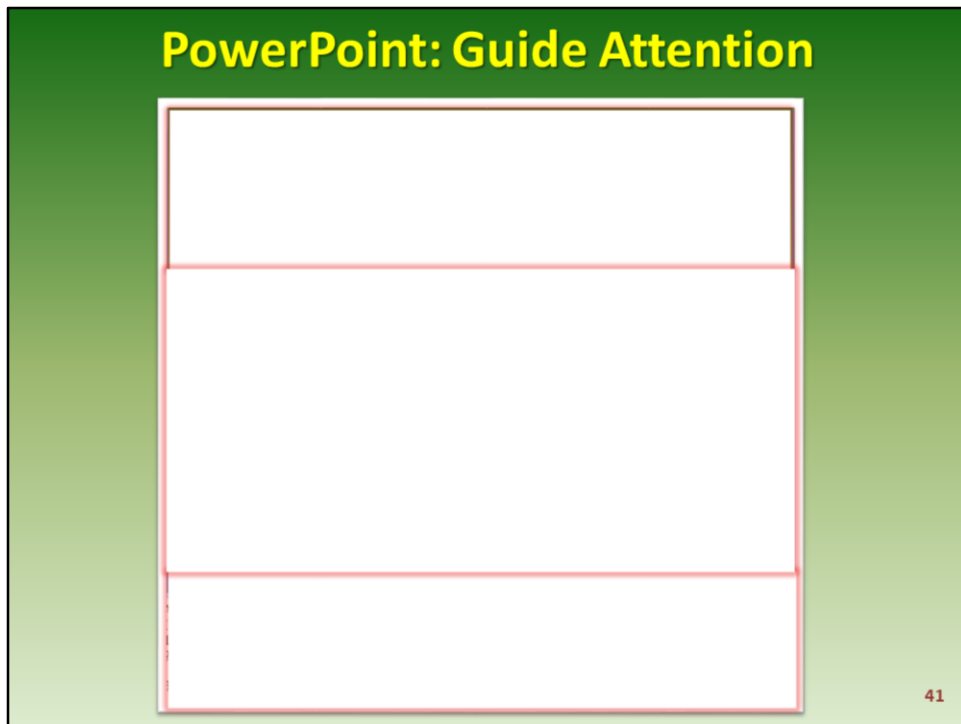
In the pipeline metaphor, a presentation is independent of the people who receive it — a presenter simply pours information into the passive minds of the audience. Yet researchers have long known that the mind is not a passive vessel, but rather it is an active participant in the process of learning. You play an important role in helping your audience understanding by designing slides that guide the attention of working memory to the most important visual and verbal information.



'What's all this got to do with presentation?

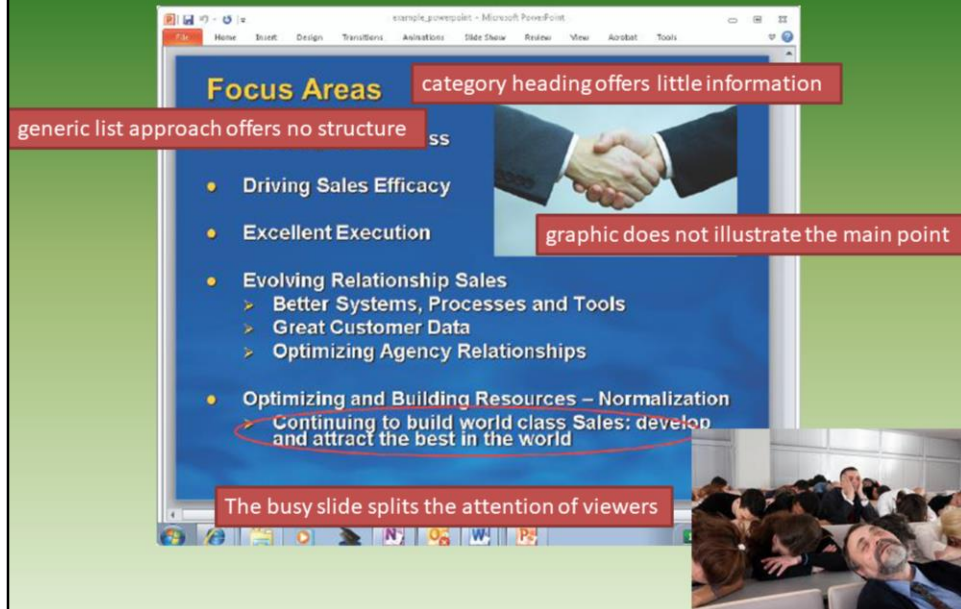






Each slide has a **headline** when you start working in PowerPoint. You then write out what you will say verbally in the off-screen text box in **Notes Page** view and then add a simple graphic in **Normal view** to produce a slide.

# The old way don't guide attention



It does not help working memory to select the most important information

- The category heading offers little information and forces the viewer to keep searching for the main point.
- The generic list approach offers no structure that ties the list items together.
- The generic graphic does not illustrate the main point of the slide.
- The busy slide splits the attention of viewers.

# Statistical data presentation

Child mortality – babies/women



Trendalyzer software system (Gapminder Foundation)

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Hans Rosling is a Swedish medical doctor, academic, statistician and public speaker. He is Professor and co-founder of the Gapminder Foundation, which developed the Trendalyzer software system.

Trendalyzer software that converts international statistics into moving, interactive graphics. The information visualization technique is an interactive bubble chart.

# Graphics

- Keep them simple
- Average attention span per slide is 8 seconds
- Title all charts, tables and diagrams
- Clarify the purpose of your slide
- Use clear explanatory labels
- Make sure to label axes!

7 November 2018

## Systolic blood pressure and incident heart failure in the elderly. The Cardiovascular Health Study and the Health, Ageing and Body Composition Study

The graph plots Relative subhazard (solid line) and 95% CI (dashed lines) against systolic blood pressure (mm Hg). The x-axis ranges from 60 to 200 mm Hg, and the y-axis ranges from 0 to 5. A horizontal reference line is drawn at HR=1.0, corresponding to a systolic blood pressure of 133 mm Hg. The relative subhazard increases as systolic blood pressure increases, starting below 1.0 at 80 mm Hg and crossing the reference line at 133 mm Hg. The 95% CI is wider at higher blood pressures, indicating greater uncertainty in the risk estimate.

The reference line (HR=1.0) represents risk when systolic blood pressure is equal to the group average (133 mm Hg).

*Butler et al, Heart 2011*

Graphics work as images. You have to explain what the graphic shows.

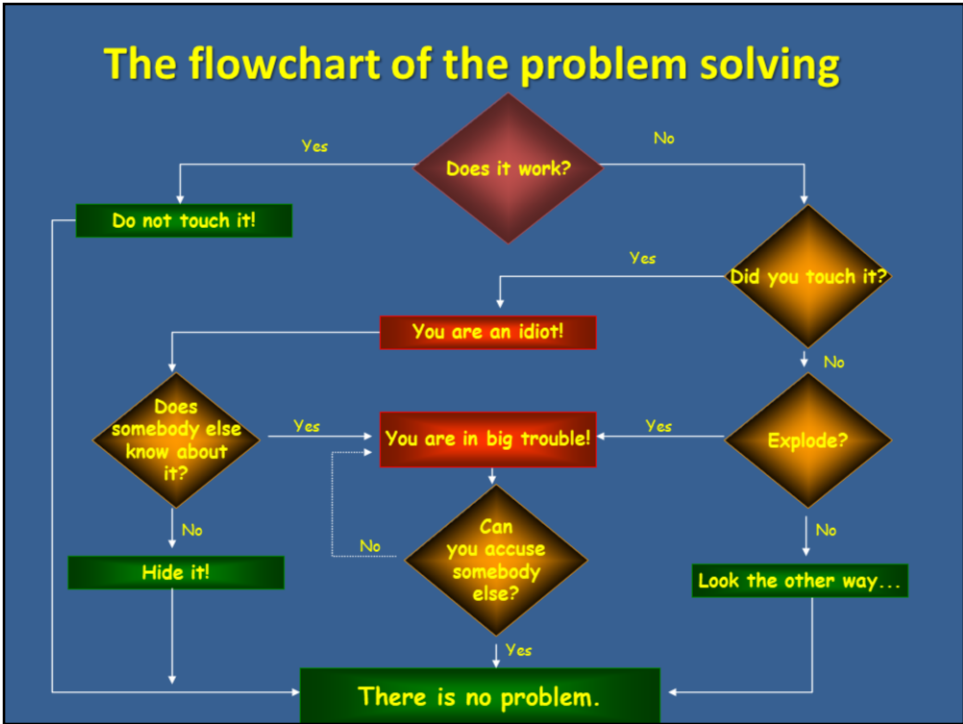
## Animation (images)



The artistic view

45

You can make some amusement animation.



Or flowcharts.

## The Prezi „virtual canvas” method



[Kép: Katy Meyers](#)

Video: Prezi Tutorial: Getting Started

Prezi is a cloud-based (SaaS) presentation software tool for presenting ideas on a virtual canvas. The product employs a zooming user interface (ZUI), which allows users to zoom in and out of their presentation media, and allows users to display and navigate through information within a 2.5D or parallax 3D space on the Z-axis.

### **Prezi Tutorial: Getting Started**

<https://www.youtube.com/watch?v=mTC3MDQJZ-U>

## Summary

Do your slides contain only words?

*Show some pictures.*

Do your slides contain words that you also speak?

*Stop being redundant.*

Do your slides contain things you don't explain?

*Get rid of them.*

Do you pause for a long time on a single slide?

*Break it up into smaller pieces.*

Do you have lots of information on a slide?

*Keep it simple.*

Cliff Atkinson<sup>48</sup>

For summary, here are five tips to help you to apply research-based design principles to presentation.

In the case of you have to put more text on a slide avoid bullet points.



## Questions

- Pipeline Concept
- Three types of human memory
- Eye of the needle metaphore
- Multiple channels in working memory
- Redundancy
- Methods to guide attention
- The three working views in PowerPoint
- Principle of PREZI