Cognitive Theory of Multimedia Learning

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Richard Mayer

"We learn better with images and words than with just words."

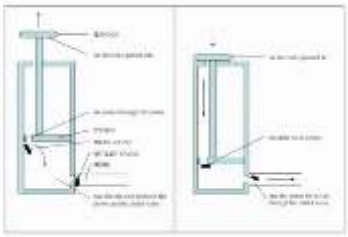
Multimedia Principle:

"We learn better with images and words that with just words"

Text only:

Bicycle tire pumps vary in the number and location of the valves they have and in the way air enters the cylinder. Some simple tire pumps have the inlet valve on the piston and the outlet valve at the closed end of the cylinder. A bicycle tire pump has a piston that moves up and down. Air enters the pump near the point where the connecting rod passes through the cylinder. *As the rod is pulled out, air passes through the piston and fills the area between the piston and the outlet valve. As the rod is pushed in, the inlet valve closes and the piston forces air through the outlet valve.*

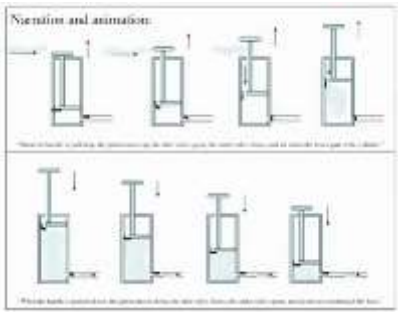
[italics added]



Narration only:

"When the handle is pulled up, the piston moves up, the inlet valve opens, the outlet valve closes and air enters the lower part of the cylinder. When the handle is pushed down, the piston moves down, the inlet valve closes, the outlet valve opens, and air moves out through the hose."

Narration and animation:



Principle of the Attention Divided in Space

We learn better if text and the corresponding image are placed near each other.

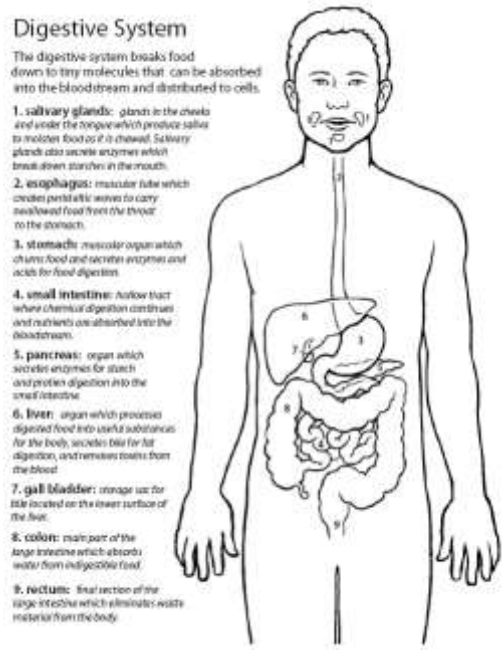
Separated Presentation

Integrated Presentation

Example 1

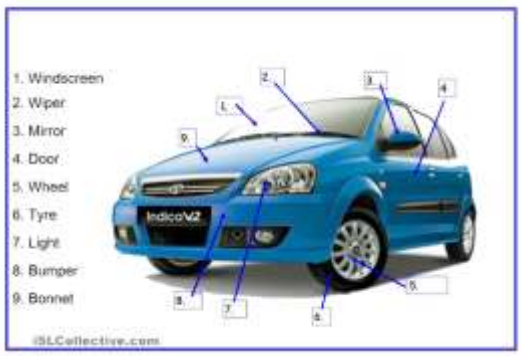
Extraneous processing

"wasted processing"

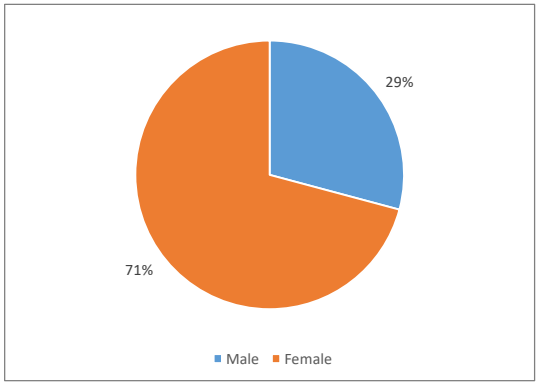


http://www.education.com/files/214501_214600/214593/inside-out-anatomy-digestive.pdf

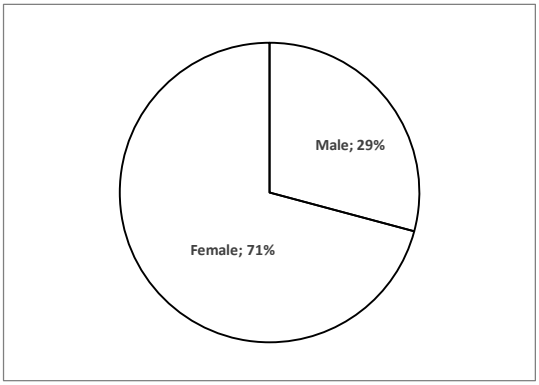
Example 2



Example 3



versus

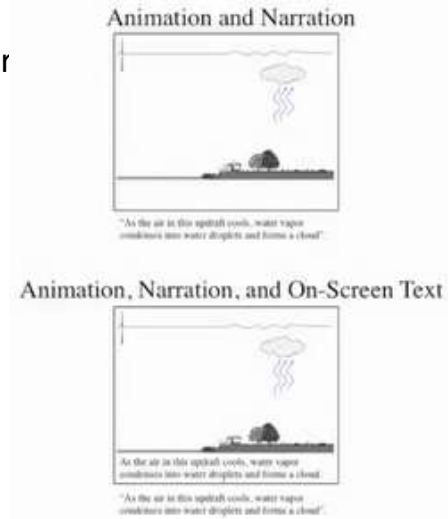


Modality Principle

- We learn more deeply if “words” are narrated, rather than printed on the screen
- This is a problem associated with the Principle of attention divided in space
- This is one of the most researched principle.

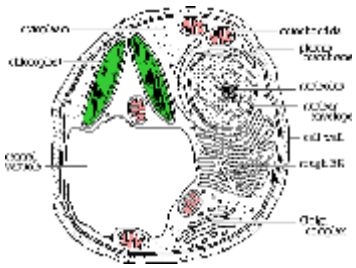
Redundancy Principle

- We learn better with just audio+image rather than audio + image + redundant text.
  - Cognitive overload
- Some exceptions (boundary conditions): teaching languages



Signaling Principle

We learn deeply when there are visual and audio clues that enphasize the main ideas.



От 2009 година в Колеж “Адам Смит” започна **включването на колежаните в изследователската част на международните проекти** като младши експерти, като по този начин се стимулира активното прилагане на наученото в различните бизнес дисциплини.Проектите са в областта на теоретичните и практически аспекти на образованието и обучението и са в рамките на Програмата за обучение през целия живот на Европейския съюз. Поканите за участие са персонални и се отправят след преценка на два основни критерия –**резултати от обучението и владеене на английски език**, който е работен и основен език за проектите. Освен практическия опит, екипите насърчават неформалното общуване в рамките на работните срещи и създаването на контакти и мрежи от контакти.

de: www.adamsmith.bg

Our Powerpoint slides…

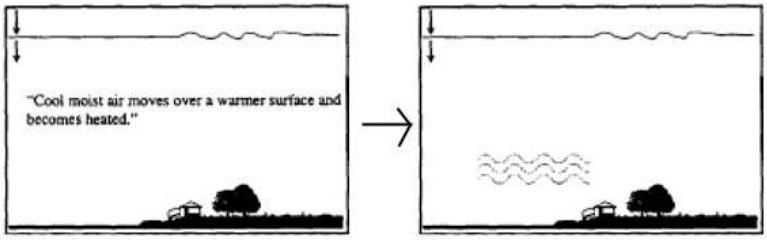
- Pay attention to topic 1
- Pay attention to topic 2
- Pay attention to topic 3

- Pay attention to topic 1
- Pay attention to topic 2
- Pay attention to topic 3

- Pay attention to topic 1
- Pay attention to topic 2
- Pay attention to topic 3

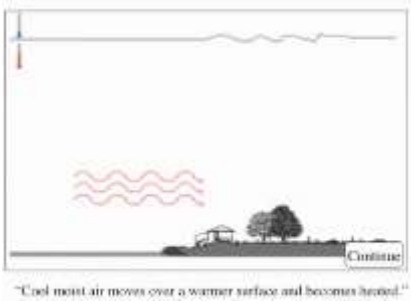
Principle of Attention Divided in Time

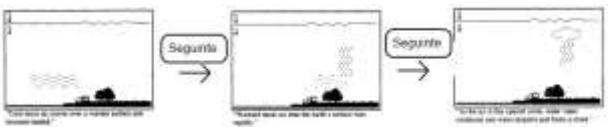
We learn deeply when images and audio are perfectly sinchronized (and not presented sequentially)



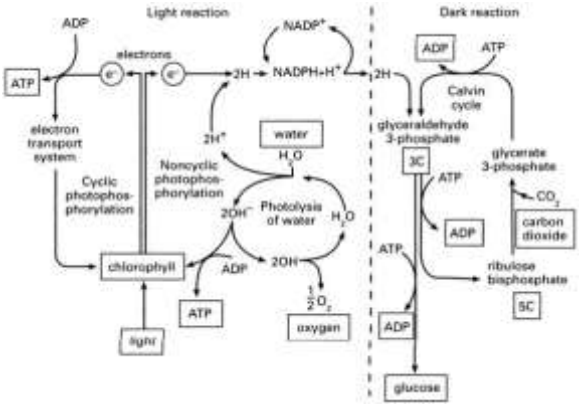
Principle of Segmentation

We learn better when a narrated animation is presented in fragments that we control (by a "next" button) than when presented in a single unit.





Example



https://benchprep.com/blog/wp-content/uploads/2012/08/photosynthesis1.jpg

What is wrong with this picture?

Principle of Personalization

We learn better when words are in an informal style rather than a formal style

Examples of Personalized and Non-Personalized Speech

Non-Personalized
"During inhaling, the diaphragm moves down creating more space for the lungs, air enters through the nose or mouth, moves down through the throat and bronchial tubes to tiny air sacs in the lungs…"

Personalized
"During inhaling, your diaphragm moves down creating more space for your lungs, air enters through your nose or mouth, moves down through your throat and bronchial tubes to tiny air sacs in your lungs…"

Other interesting studies

Getting the point: Tracing worked examples enhances learning

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ABSTRACT

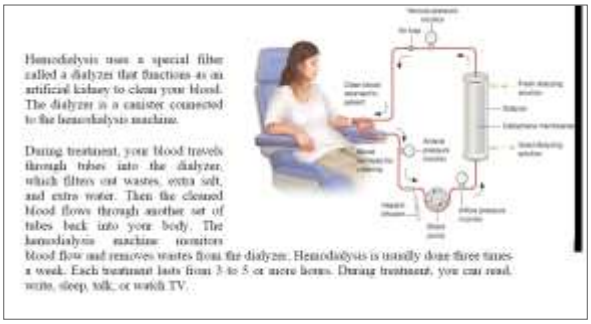
Embodied cognition and evolutionary educational psychology perspectives suggest pointing and tracing gestures may enhance learning. Across two experiments, we examine whether explicit instructions to trace out elements of geometry worked examples with the index finger enhance learning processes and outcomes. In Experiment 1, the tracing group solved more test questions than the non-tracing group, solved them more quickly, n
replicated and extended the
across conditions, such that
paper, who in turn outperfo
the activation of an increasi

One of the main ways in which we interact with the environment is with our hands. A rapidly expanding body of research has demonstrated that hand movement and position can substantially affect cognitive processing. In particular, pointing gestures accompanied or not by touch, are of particular interest in the current study for their potential to affect information processing and subsequent learning. For the purpose of drawing attention, a pointing gesture apparently could serve as a primitive but effective attention-guiding cue, as people start using pointing to manage joint attention and interest as young as 12 months of age

http://www.sciencedirect.com/science/article/pii/S0959475214000929

Inserting the presenter (teacher) in the content usualy adds value to the content itself.

(non verbal communication)



What multimedia principles are violated here?

- Segmentation
- Atention divided in space

What could be a solution?

- A video!