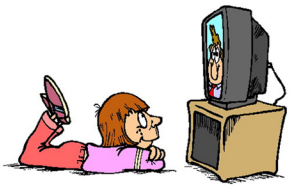
SCIENCE OF LEARNING RESEARCH CENTRE

PEN Principle

Visual Images & Spoken Word Mix Well

Psychology



Our auditory threshold is uneffected whilst viewing visual images.
Our visual threshold is also uneffected whilst listening to oral speech.
This is why we can so easily watch and understand TV programs & films.

Alais, D., Morrone, C., & Burr, D. (2006). Separate attentional resources for vision and audition. *Proceedings of the Royal Society of London B*, 273, 1339–1345.

Similarly, our ability to memorize visual images and oral words is uneffected when performing both memorization tasks simultaneously.

Johnson, J. A.,&Zatorre, R. J. (2006). Neural substrates for dividing and focusing attention between simultaneous auditory and visual events. *NeuroImage*, 31, 1673–1681.

Education

The Modality Principle

Students presented with auditory text accompanied by relevant images often demonstrate more rapid and more accurate learning than those presented with only auditory text.

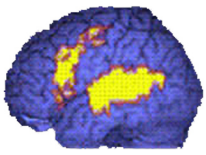
K"uhl, T., Scheiter, K., Gerjets, P., & Edelmann, J. (2011). The influence of text modality on learning with static and dynamicvisualizations. *Computers in Human Behavior*, 27, 29–35.

Students presented with an image-based teaching aid (PowerPoint) during an oral lecture often display an increase in information retention and improved exam performance.

Hallet, T.L., & Faria, G. (2006). Teaching with multimedia: Do bells and whistles help students learn? *Journal of Technology in Human Services*, 24, 167-179.

Neuroscience

This brain is
LOOKING AT IMAGES



This brain is
LISTENING TO WORDS

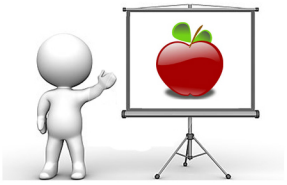
Looking at images and listening to words utilize distinct, non-overlapping brain regions. This is why successfully doing both simultaneously is easily accomplished.

Buchweitz, A., Mason, ra, Tomitch, L, & Just, MA (2009). Brain activation for reading and listening comprehension: An fMRI study of modality effects and individual differences in language comprehension. *Psychology & Neuroscience*, 2(2), 111-123.

Akimoto, Y, et al. (2013). Spatiotemporal dynamics of high-gamma activities during a 3-stimulus visual oddball task. *PloS One*, 8(3), e59969.

Classroom Applications

When utilizing PowerPoint, the chalkboard, or hand-outs during an oral lecture/lesson, include relevant visual images.



When designing a self-guided computer-based lecture/lesson, include concurrent auditory information and relevant visual images.

Allowing students access to image-based hand-outs or slides during a lecture/lesson will not negatively impact listening and/or comprehension.

Ideas and Future Questions...

Do moving images work as-well-as or better-than static images?
How does the emotional valence of visual images impact the comprehension and retention of concurrent oral speech?