SCIENCE OF LEARNING RESEARCH CENTRE

PEN Principle

Written Text & Spoken Word Do Not Mix

Psychology

Dichotic Listening:

When trying to listen to two simultaneous speakers, we can listen to and understand only one at a time - attempts to listen to both results in neither being understood.

Hugdahl, K., Westerhausen, R., Alho, K., Medvedev, S., Laine, M., & H"am"al"ainen, H. (2009). Attention and cognitive control: Unfolding the dichotic listening story. *Scand J Psychol*, 50, 11–22.

Similarly, when trying to read and listen to a speaker, we can attend to and understand only one at a time - attempts to understand both results in neither being understood.

Lin, L., Lee, J.,&Robertson, T. (2011). Reading while watching video: The effect of video content on reading comprehension and media multitasking ability. *Journal of Educational Computing Research*, 45,183–201.

Education

The Redundancy Principle

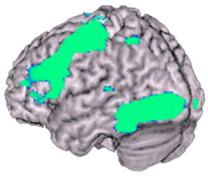
Students presented with either auditory or written forms of material often demonstrate more rapid and more accurate learning than those presented with both forms of material.

Toh, S. C., Munassar, W. A. S., & Yahaya, W. A. J. W. (2010). Redundancy effect in multimedia learning: A closer look. Curriculum, Technology & Transformation For An Unknown Future. *Proceedings Ascilite Sydney*, 988-998.

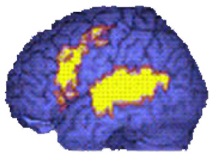
Students presented with a text-based teaching aid (PowerPoint) during an oral lecture often display a reduction in information retention and impaired exam performance.

Wecker, C. (2012). Slide presentations as speech suppressors: When and why learners miss oral information. *Computers & Education*, 59(2), 260-273.

Neuroscience



This brain is READING WORDS



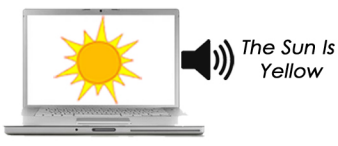
This brain is LISTENING TO WORDS

Listening to and reading words relies largely on the same neural structures. This is why attempting to do both simultaneously is a difficult (often impossible) feat.

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.

Classroom Applications

When utilizing PowerPoint, the chalkboard, or hand-outs during an oral lecture/lesson, avoid the inclusion of text as much as possible.



When designing a self-guided computer-based lecture/lesson, avoid including both oral and textual instructions (chose one or the other).

When distributing text-based hand-outs or lecture notes to students, try to do so at the end of the lecture/lesson (to avoid attempted reading during the oral presentation).

Ideas and Future Questions...

There is evidence that writing utilizes similar neural structures as reading and listening to oral speech. How might this impact note-taking during a lecture/lesson?