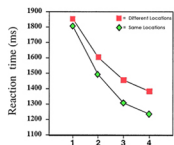


PEN Principle

Spatial Predictability Guides Attention



Psychology



Contextual Cueing

If a shifting visual object (or series of objects) appear in the same location or surrounded by the same visual info over time, people will be quicker to locate and attend to it than if it appears at varied locations.

Chun, M. M., & Jiang, Y. (1998). Contextual cueing: Implicit learning and memory of visual context guides spatial attention. *Cognitive Psychology*, 36, 29-71.



Contextual cuing is thought to reflect implicit learning - suggesting no conscious effort is required in order to enhance attention and comprehension.

Summerfield, C., & Egner, T. (2009). Expectation (and attention) in visual cognition. *Trends in Cognitive Sciences*, 13, 403-409.

Education

Current Step



The Signaling Principle

Student comprehension and memorization is improved when attentional cues (such as spatial predictability) are used to highlight relevant information during learning.

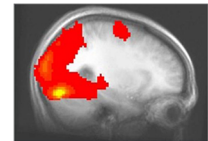
Mayer, R. E. (2009). *Multimedialearning* (2nd ed.). Cambridge, England: Cambridge University Press.



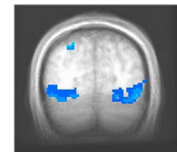
Students presented with successive images in the same location performed significantly better on a post-activity exam than students presented with the same images in unpredictable locations

Ragan, E. D., Endert, A., Bowman, D. A., & Quek, F. (2012). How spatial layout, interactivity, and persistent visibility affect learning with large displays. In *Proceedings of the International Working Conference on Advanced Visual Interfaces* (pp. 91-99). New York, NY: ACM Press.

Neuroscience



This brain is viewing images presented at random, unpredictable locations (Red = Strong Activation).



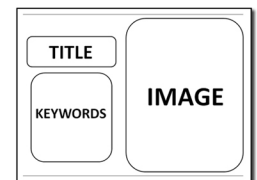
This brain is viewing images presented at predictable locations (Blue = Weak Activation)

The ability to predict where an image, word, or object will be located in space decreases the amount of neural resources required to identify and process it.

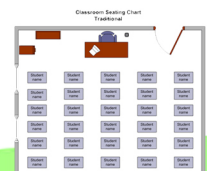
Westberg, C.E., Miller, B.B., Reber, P.J., Cohen, N.J., & Paller, K.A. (2011). Neural correlates of contextual cueing are modulated by explicit learning. *Neuropsychologia*, 49(12), 3439-3447.

Classroom Applications

When utilizing PowerPoint or slides during a lesson, utilize clear and unambiguous formatting to delineate where images, titles, and any text will appear. Use the same format on all slides.



Delineate a clear area on the chalk-board where daily instructions or notes will be placed. Use this same location every day.



Determine how to best organize the desks and materials in your classroom. Maintain this organization throughout the semester.

Ideas and Future Questions...

How does spatial predictability relate assigned seating-arrangements?

Is it possible asking students to sit in the same location everyday can ease cognitive burden and enhance learning?

