



ASMCUE 2010
Additional resources re: Visual literacy
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Guidelines for creating effective visualizations [Tversky 2005]:

- Map the structure & content of the information to be conveyed on the structure & content of the diagram
- Use extra-pictorial devices like arrows & guidelines unambiguously
- Craft diagram to explain, not just show
- Check if students learn what is intended and don't learn misconceptions

Five principles for the design of visualization tools that support students' visuospatial thinking [from Wu and Shah (2004)]:

- Provide multiple representations and descriptions
- Make linked referential connections visible
- Present the dynamic and interactive nature of chemistry
- Promote the transformation between 2D and 3D
- Reduce cognitive load by making information explicit and integrating information for students

Key criteria for visualizations to succeed in the construction of a successful framework for inquiry-based learning [from Edelson and Gordin (1998)]:

- Motivating context
- Learner-appropriate activities
- Data selection
- Scaffolding interfaces
- Support for learning

Suggested resources (these are the papers relevant to this workshop, but there are many other excellent resources on visual learning and visualizations):

- Bransford, J.D., Brown, A.L. & Cocking, R.R. (eds.) (1999) How People Learn: Brain, Mind, Experience, and School. Washington, DC: National Academy Press.
- Christopherson, J. T. (1997). The growing need for visual literacy at the university. Paper presented at the Visionquest: Journeys toward visual literacy; 28th Annual Conference of the International Visual Literacy Association, Cheyenne, WY.
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- Gilbert, J.K. (ed) (2005) *Visualization in Science Education*, Dordrecht: Springer.
- Mayer, R. E. (2001). *Multimedia Learning*, Cambridge: Cambridge University Press.
- Reed, S.K. (2010) *Thinking Visually*, New York: Psychology Press (Taylor & Francis).
- Richardson, D. C., & Richardson, J. S. (2002). Teaching molecular 3-D literacy. *Biochemistry and Molecular Biology Education*, 30(1), 21-26.
- Tufte, E.R. (1990) *Envisioning Information*, Cheshire, CT: Graphics Press.
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- Tufte, E.R. (2001) *The Visual Display of Quantitative Information*, Cheshire, CT: Graphics Press.
- Tversky, B., Morrison, J., & Betrancourt, M. (2002). Animation: Can It Facilitate? *International Journal of Human Computer Studies*, 57, 247-262.
- Tversky, B. (2005). Visuospatial Reasoning in *The Cambridge Handbook of Thinking and Reasoning*, K. Holyoak and R. Morrison eds, Cambridge: Cambridge University Press.
- Wu, H.-K., & Shah, P. (2004). Exploring visuospatial thinking in chemistry learning. *Science Education*, 88, 465-492.