Chapter 3.11
Information and Visualization Imagery

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ABSTRACT

Information and visualization imagery conveys data for more effective learning and comprehension, memory retention; analytic tractability; decision-making and information aesthetics. These types of visualization imagery may be built both in simple and complex ways. Complex and live data streams may be collated and delivered via interactive tools delivered via the Web, with some bolstering simulation learning. This chapter addresses the types of visualizations used in e-learning, strategies for creating these, and the ways to avoid unintended and negative learning.

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CHAPTER OBJECTIVES

- Define information and visualization imagery and their uses in e-learning
- Explore the types of visualizations used in e-learning (in terms of dimensions, delivery devices, and extreme visualizations)
- Investigate the processing spectrum of digital imagery for information and visualization
- Describe some core components of complex, multi-stream visualizations
- Explain the main reasons to visualize information
- Contrast static with dynamic information visualizations

- Study the value-added extraction of information from visualizations
- Consider live data streams and complex multi-stream visual information
- Address strategies for creating effective information imagery and visualization imagery
- Describe how to design a full mental model
- Explore how to avoid misconceptions or negative learning
- Provide a method for evaluating information and visualization imagery

INTRODUCTION

Epidemiologists use these to track the spread of a disease through a population and to track how it is spread. Chemists view these to predict complex molecular interactions. Scientists use these (in part) to decide whether a spaceship should be launched into orbit. Architects use these to discuss a building's floor plan. Economists examine various scenarios depicted by these. Environmentalists view these to plan how to go about protecting a forest habitat. Meteorologists use these to predict the general landfall of a hurricane. Archaeologists go to a website to check out the stratigraphy of an archaeological dig half a world away. Deep sea divers study these to get a sense of the particular environments that they'll be entering. What these professionals refer to are information and visualization imagery.

Visualizations are a powerful affordance of digital and Web technologies. Foremost, these enable the communication of complex and information-rich details via imagery. They enable fresh ways of modeling information, particularly those with spatio-temporal aspects or large quantitative datasets. Designing visualization languages is "grounded in human conceptualization" (Douglas, Hundhausen & McKeown, 1995, p. 342). This field draws on typography, graphics, psychology and computer science. In recent decades, these have been designed to operate in computer and virtual environments.

These depictions, if designed around learning theory and instructional design, may increase the "learnability" of some course contents (Duchastel, 2003, pp. 310 – 311).

Ware defines visualization as 'a graphical representation of data or concepts,' which is either an 'internal construct of the mind' or an 'external artifact supporting decision making.' In other words, visualizations assist humans with data analysis by representing informational visually. This assistance may be called cognitive support (Tory & Möller, Jan. – Feb. 2004, p. 72).

Information imagery and visualizations enhance complex analysis and decision-making by engaging large datasets in manageable ways. These approaches to handling information have integrated technologies like cameras and sensors to create live situational awareness. Robots may be sent to capture a 3D view of an indicated position (Kemp, Anderson, Nguyen, Trevor, & Xu, 2008). Visualizations may involve the use live datafeeds. These enable the monitoring of situations, and the inspection and exploration of difficult environments using sensors. These enable high-risk or hostile environment simulations. Visualizations may be employed to develop schemas or mental models. Extremely large and extremely small (mesoscale to nano-scale) may be depicted. Even elusive works of the imagination may be captured as through gyrokinetic simulations (Crawford, Ma, Huang, Klasky, & Ethier, 2004) and particle-level interactions (Ma, Schussman, Wilson, Ko, Qiang & Ryne, 2002). Various futures may be projected on trend lines using visualizations.

Experiential situated cognition may be employed to model the real world, with plenty of modeling of natural physics and phenomena: flora and fauna, oceans, clouds, fire, landscaping, and the earth and sky (The elements of nature: Interactive and realistic techniques, 2004, n.p.). Ultimately,

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