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CENTER FOR TEXTUAL STUDIES AND
DIGITAL HUMANITIES

402 - Instructional Design and e-Learning

Spring Semester 2016

Week 5 - Extra

visuals and text in e-Learning - cont'd

coherence principle 2 - extraneous graphics

- addition of related but not directly relevant graphics to e-Learning design

- simply, avoid adding extraneous pictures and graphics

- does not imply that interesting graphics are harmful

- additional barrier to learning, not wise design

- extraneous graphics distracting and disruptive to learning process

- in science and mathematics textbooks many illustrations found to be irrelevant to the main lesson theme

  - Mayer, R.E., Sims, V., and Tajika, H. 1995. "A comparison of how textbooks teach mathematical problem solving in Japan and the United States." American Educational Research Journal 32. PP.443-460.

visuals and text in e-Learning - cont'd

coherence principle 2 - psychological reasons to avoid extraneous graphics

- arousal theory

- extraneous graphical items as emotion grabbing techniques

- learner actively seeking to comprehend presented material

- extraneous images and text captions can interfere with learning in 3 ways

    - distraction

    - disruption

    - seduction

    - Harp, S.F., and Mayer, R.E. 1998. "How seductive details do their damage. A theory of cognitive interest in science learning." Journal of Educational Psychology 90. PP.414-434.

- interesting but unnecessary material can harm the learning process

visuals and text in e-Learning - cont'd

coherence principle 2 - evidential support for omission of extraneous graphics part 1

- three minute narrated animation on lightning formation

    - Mayer, R.E., Heiser, J., and Lonn, S. 2001. "Cognitive constraints on multimedia learning: When presenting more material results in less understanding." Journal of Educational Psychology 93. PP.187-198.

"Statistics show that more people are injured by lightning each year than by tornadoes and hurricanes combined."

"...when presenting more material results in less understanding."

- adding irrelevant illustrations to scientific text hurt learning

    - Sanchez, C.A., and Wiley, J. 2006. "An examination of the seductive details effect in terms of working memory capacity." Memory and Cognition 34. PP.344-355.
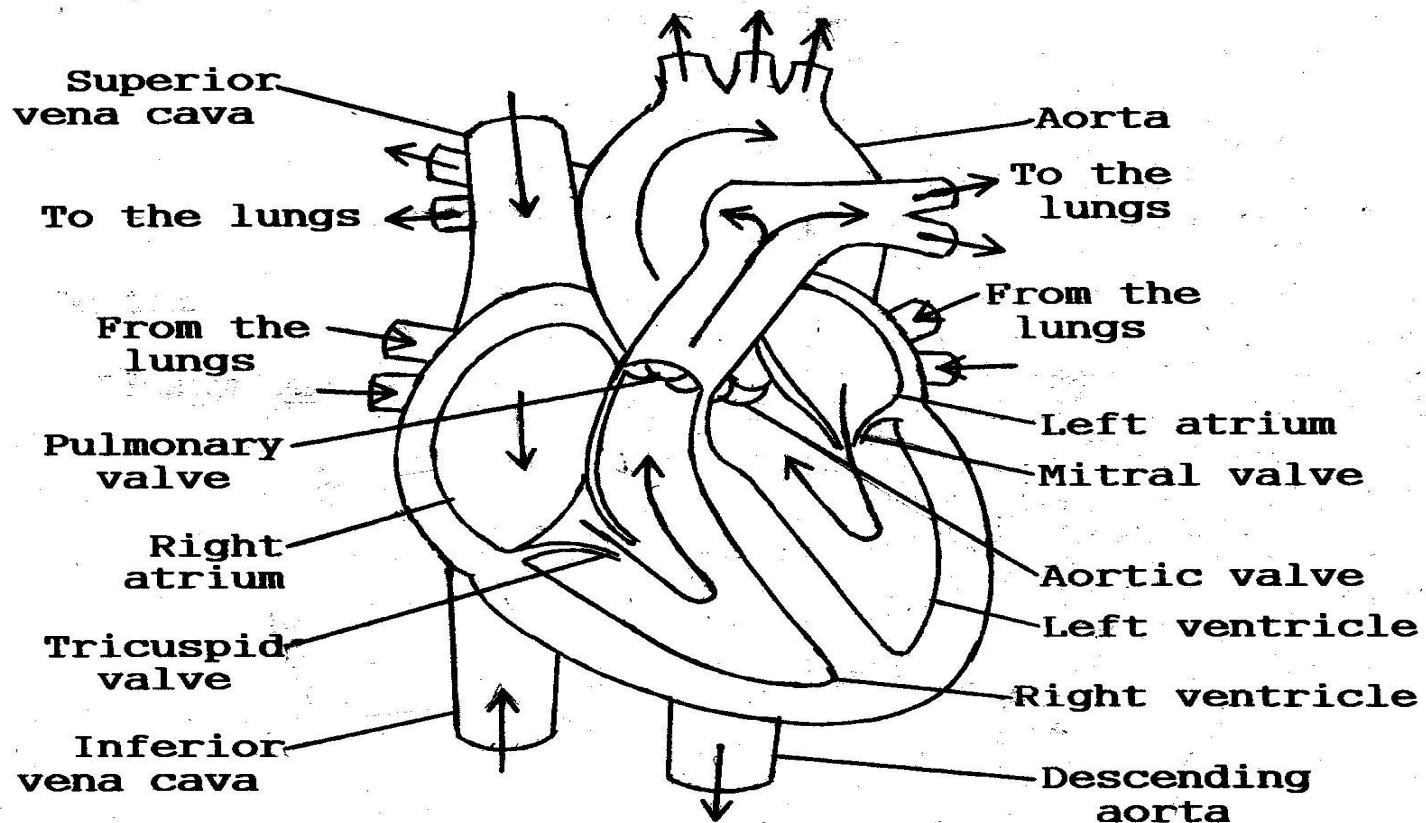
visuals and text in e-Learning - cont'd

coherence principle 2 - evidential support for omission of extraneous graphics part 2

- embellishment of illustrations to achieve greater realism not necessarily beneficial
- simple line drawings more effective than detailed colour drawings
    - Butcher, K.R. 2006. "Learning from text and diagrams: Promoting mental model development and inference generation." Journal of Educational Psychology 98. PP.182-197.
- students who learned with text and simple illustrations performed better
- more integration inferences compared with other students
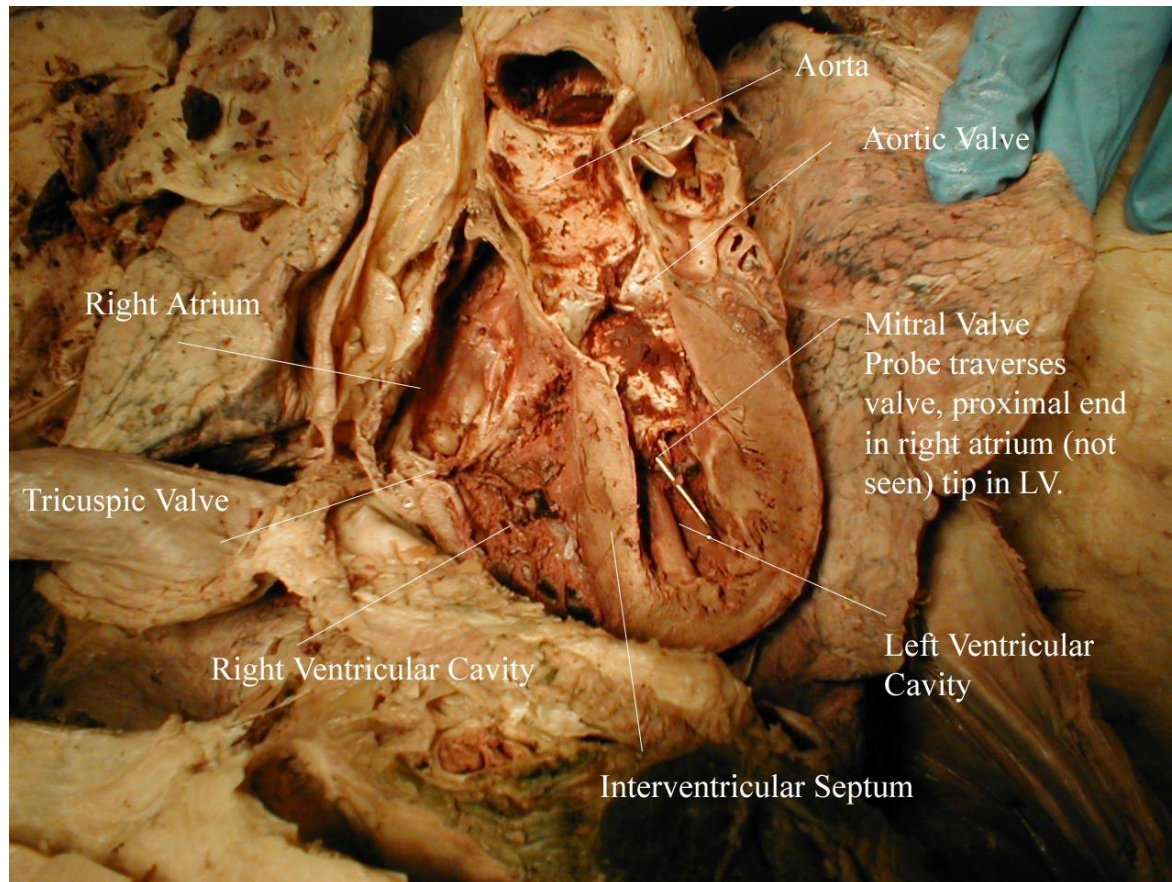- studying simplified visual may promote greater mental processing by learners

visuals and text in e-Learning - cont'd

coherence principle 2 - image tests

visuals and text in e-Learning - cont'd

coherence principle 2 - image tests

visuals and text in e-Learning - cont'd

coherence principle 3 - extraneous words & psychological reasons

- interesting but extraneous words may result in poorer learning
    - avoid addition of interesting but unnecessary extraneous words
- embellishments may not produce the desired effect
- consider relative to limited screen real estate and network bandwidth
- helps implement modality principle
- extra words can interfere with the learning process
- extraneous words added for interest, elaboration or technical depth
    - still considered extraneous to the initial e-Learning

visuals and text in e-Learning - cont'd

coherence principle 3 - evidential support for omission of extraneous words

Part 1 - Interest

- 3 minute narrated animation about lightning formation with and without additional narration segments

    - Mayer, R.E., Heiser, J., and Lonn, S. 2001. "Cognitive constraints on multimedia learning: When presenting more material results in less understanding." Journal of Educational Psychology 93. PP.187-198.

- without extraneous information generated ~34% more solutions on transfer test

- extraneous words do not help learning, and may even be considered to have hurt learning in this example
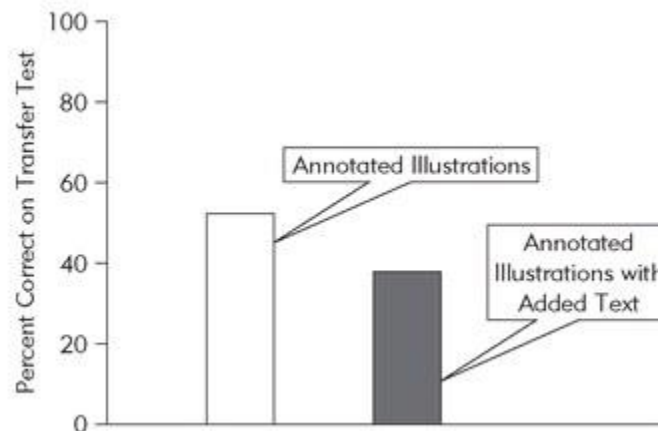
visuals and text in e-Learning - cont'd

coherence principle 3 - evidential support for omission of extraneous words

Part 2 - Elaboration

- students read standard lightning passage or a series of summary captioned illustrations

   - Mayer, R.E., Bove, W., Bryman, A., Mars, R., and Tapangco, L. 1996. "When less is more: Meaningful learning from visual and verbal summaries of science textbook lessons." Journal of Educational Psychology 88. PP.64-73.

visuals and text in e-Learning - cont'd

coherence principle 3 - evidential support for omission of extraneous words

Part 3 - Technical Depth

- multimedia lesson on motion of ocean waves with concise and embellished versions

    - Mayer, R.E., and Jackson, J. 2005. "The case for coherence in scientific explanations: Quantitative details can hurt qualitative understanding." Journal of Experimental Psychology: Applied 11. PP.13-18.

- embellished version included additional words and graphics, such as formulae, computational details...

"The added quantitative details may have distracted the learner from constructing a qualitative model of the process of ocean waves."

visuals and text in e-Learning - cont'd

coherence principle - missing details

- strong and consistent support for the coherence effect

- still much we do not know about the coherence principle

- much evidential support focused on short, lab controlled lessons

- 'signaling' technique

    - Mautone, P.D., and Mayer, R.E. 2001. "Signaling as a cognitive guide in multimedia learning." Journal of Educational Psychology 81. PP.240-246.

visuals and text in e-Learning - cont'd

coherence principle - pre-existing knowledge

- application of coherence effect on more adept, expert audiences
- expertise reversal effect

    - Kalyuga, S. 2005. "Prior knowledge principle in multimedia learning." In "The Cambridge handbook of multimedia learning." Cambridge University Press. PP. 325-337.

- instructional design techniques targeted at beginners may not be useful for adept, expert audiences
- Mayer and Jackson (2005) and Sanchez and Wiley (2006) provide research and support for beginners
- more research needed for application to expert audiences
- impact of pre-existing knowledge on research results

design and development in e-Learning

personalisation principle - intro

- less formal, more conversational style of design and lesson material
- role of the speaker's voice in presentations and lessons
- important in design of paedagogical agents or on-screen characters

design and development in e-Learning

personalisation principle 1 - conversational

- style approximates human conversation
- often perceived by learner as conversational partner
- formal considered quite impersonal, on-screen agent absent, overall formal tone
- designs recommended to include some spoken or printed text in conversational style
- second person, active voice with relational details and comments on the presented problem or material
    - describing a mathematical problem in real-world context...

design and development in e-Learning

personalisation principle 1 - psychological reasons

- common sense derived view
    - convey important and pertinent information
    - impersonal style conveys message that training is not serious
    - keeps things simple, present only the basic, core information
    - based on 'information delivery' view of learning
- inconsistent with how the human mind works
- instruction should present information and prime learner's cognitive processing
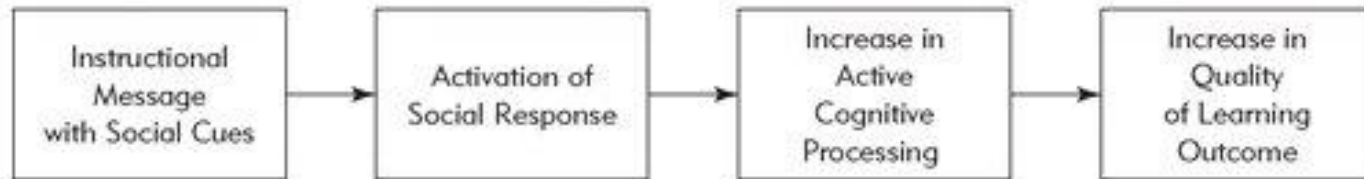- discourse processing
    - Beck, I., McKeown, M.G., Sandora, C., Kucan, L., and Worthy, J. 1996. "Questioning the author: A year-long classroom implementation to engage students in text." Elementary School Journal 96. PP. 385-414.
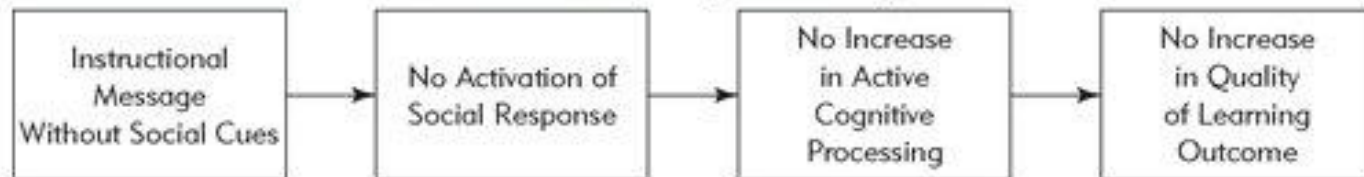
design and development in e-Learning

personalisation principle 1 - psychological reasons

How Social Cues Prime Deeper Learning

Instructional Message with Social Cues	→	Activation of Social Response	→	Increase in Active Cognitive Processing	→	Increase in Quality of Learning Outcome

How Lack of Social Cues Does Not Prime Deeper Learning

Instructional Message Without Social Cues	→	No Activation of Social Response	→	No Increase in Active Cognitive Processing	→	No Increase in Quality of Learning Outcome

Mayer, R.E. 2005. "Principles based on social cues: Personalization, voice, and image principles." In "The Cambridge handbook of multimedia learning." Cambridge University Press. PP.201-212.

design and development in e-Learning

personalisation principle 1 - evidential support for conversational style (part 1)

Formal Version:

"This program is about what type of plants survive on different planets. For each planet, a plant will be designed. The goal is to learn what type of roots, stems, and leaves allow the plant to survive in each environment. Some hints are provided throughout the program."

Personalized Version:

"You are about to start a journey where you will be visiting different planets. For each planet, you will need to design a plant. Your mission is to learn what type of roots, stems, and leaves will allow your plant to survive in each environment. I will be guiding you through by giving out some hints."

Moreno, R., and Mayer, R.E. 2000. "Engaging students in active learning: The case for personalized multimedia messages." Journal of Educational Psychology 93. PP.724-733.

design and development in e-Learning

personalisation principle 1 - evidential support for conversational style (part 2)

- narrated animation on lightning formation
    - Moreno, R., and Mayer, R.E. 2000. "Engaging students in active learning: The case for personalized multimedia messages." Journal of Educational Psychology 93. PP.724-733.
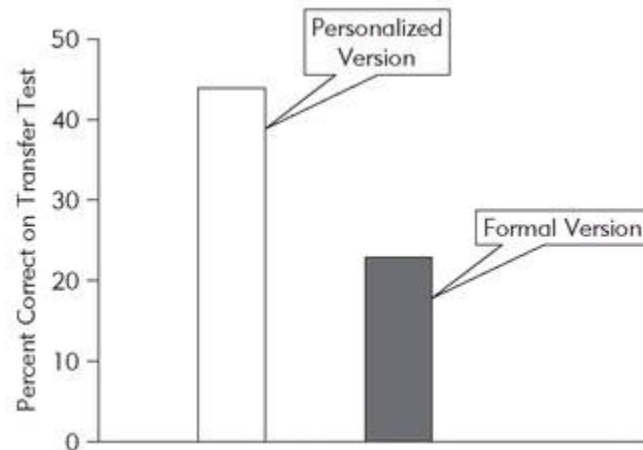
design and development in e-Learning

personalisation principle 1 - voice quality

- under the right circumstances people "treat computers like real people"

   - Reeves, B., and Nass, C. 1996. "The media equation: How people treat computers, television, and new media like real people and places." Cambridge University Press.

- narrator's voice as human and not synthesised, computer generated

   - Mayer, R.E., Sobko, K., and Mautone, P.D. 2003. "Social cues in multimedia learning: Role of speaker's voice." Journal of Educational Psychology 95. PP.419-425.

- online mathematics lessons with an on-screen agent named 'Peedy the Parakeet'

   - Atkinson, R.K., Mayer, R.E., and Merrill, M.M. 2005. "Fostering social agency in multimedia learning: Examining the impact of an animated agent's voice." Contemporary Educational Psychology 30. PP.117-139.

- voice principle

- characteristics of the narrator's voice

- perceived gender bias and preference in choice of narrator's voice

   - Nass, C., and Brave, S. 2005. "Wired for speech: How voice activates and advances the human-computer relationship." MIT Press.