Fostering Perceptual Skills in Medical Diagnosis

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AERA – 2011

Perceptual skills

- Specifying body parts that might be affected by the disease
  - Visual search and identification of relevant elements
- Specifying the motion pattern of those body parts
  - Visual inspection and interpretation of relevant elements
- Diagnosis of the disease
  - Assignment of observations to the according diagnosis

Based on perceptual input, i.e., perceptual skills

Based on conceptual knowledge

Conveying Perceptual Skills

Many instructional material use expert knowledge to convey skills to learners

A prototypical instructional method for initial skill acquisition is example-based learning, like

- Worked examples
- Cognitive modeling

Instructional Approach: Example-based learning

Learning by studying examples of successful task performance is more efficient than learning by problem-solving alone.

Learning by observing a model during task performance

“Modeling” processes that are not directly observable, like cognitive processes:

Model verbalizes her/his internal states (cf. cognitive apprenticeship, process-oriented worked-examples)

HOWEVER:

Only cognitive skills were modeled so far (reading, writing, calculating,...)

We need to model perceptual skills!

Directly capturing and displaying perceptual skills by means of eye tracking

Eye tracking: Tracking the movements of the eyeball(s) to learn where a person looked, for how long, and in what order.

From Holmqvist, Nyström, Andersson, Dewhurst, Jarodzka, & van de Wijer (2011)
Novel Instructional Approach: Eye Movement Modeling Examples

(Van Gog, Jarodzka, Scheller, Gerjets, & Paas 2009)

Design & Sample Size

N = 60 medical students in their Final year

Eye movement modeling examples during learning

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<tr>
<th>Control</th>
<th>Circle display</th>
<th>Spotlight display</th>
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Learning Phase: Attention Guidance

Two single infants aged 3 weeks and 7 months; prototypical cases of epilepsy

Testing Phase: Visual Search of Relevant Elements

"Please take a look at the way the infant behaves."

Testing Phase: Interpretation of Relevant Elements

Which body parts are affected by the disease?
How do these body parts move?
Do the movements change after touching the infant?
Is the face diseased?
What is the infant's level of consciousness?

Results

1. Successful attention guidance: closer to expert's gaze
   spotlight display < other two groups
2. More efficient visual search: faster and longer on relevant features
   spotlight display > other two groups
3. Better interpretation performance: higher MCQ scores
   spotlight display > other two groups
Thank you for your attention!

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