

Radiological Expertise and Its Acquisition

Alan Lesgold
 Robert Glaser
 Harriet Rubinson
 Dale Klopfer

Data will be presented from studies of radiology residents and experts showing differences in the qualitative characteristics of the diagnostic process at journeyman and master levels. These differences are generally consistent with other data on expertise but have a unique qualitative character because of the heavy perceptual loading of the radiological diagnosis task in addition to its cognitive side. Expertise plays a heavy role even in *where* particular features are seen. Preliminary results of longitudinal tracking of attended features over the course of learning will be used to illustrate effects of deep conceptual knowledge on diagnosis.

Some of the assertions supported by the results to date include:

- The ability to construct detailed mental representations of the physical situations which gave rise to an image is a critical aspect of expertise in perceptual diagnostic skills.
- The knowledge which underlies radiological expertise includes the mental representation of relevant body structures, a theory of the perturbation of those structures under pathology, and the projection of those structures into the domain of diagnostic images.
- Experts have more automated perceptual processes that are sensitive to a variety of anatomical variations. These automated capabilities are the product of more elaborated and flexible schemata that are slowly built up over the course of training.
- Novices have difficulty constructing representations in which the same stimulus feature is mapped onto two different objects.
- The precise, rapid recognition skill that characterizes expertise involves interactions between higher and lower levels of representation. It is not purely top-down or bottom-up.
- Experts recognize constraints on problem solution early but defer decisions until they are necessary. Experts are opportunistic planners.
- Novices are more likely to maintain bad film interpretations in the face of discrepant evidence from the patient's clinical history.
- Novice schemata are classic and less tunable