This may provide a possible explanation for the fact that the use of "diversion" could avoid direct confrontation and reserve buffers for relationship building and maintenance. Therefore, this study not only replicates the existing literature in that the categories of CCSs are indeed universal and generic to different cultures but also sheds light on Chinese cultural features involving crisis communication.

The paper concludes with a discussion of practical applications and cultural implications of the results.

(Luuk van Waes)

Expertise

R. Rikers, F. Paas (2005). **Recent advances in expertise research**. *Applied Cognitive Psychology, 19* (2), 145–149.
K. Ericsson (2005). **Recent advances in expertise research: a commentary on the contributions to the special issue.** *Applied Cognitive Psychology, 19* (2), 233–241.

If people are asked to use a computer program for the very first time, they will differ from experienced users in many respects. They will be slower than experts and make many more errors, they will have an inferior memory of what is going on, long-term as well as short-term, and they will have a very simple and superficial representation of the problem they are asked to solve. How can we help these beginners to use the program quickly and without errors? In fact we would like to make experts of them. Usually, the starting point for this is to do this through text: we design a manual or a course to teach him. In order to design a good text and/or training, it is important to understand the differences in performance between accomplished and less accomplished performers in a domain. Expertise research started with classical studies of De Groot (1946, 1978) into chess. Applied Cognitive Psychology presents an overview of recent expertise research, a selection of papers presented at the AERA Conference in San Diego (2004).

Two studies in the special issue focus on chess as their domain of investigation. One focuses on the of role meta-cognitive control strategies while learning, the other on the role of deliberate practice in the development of expertise: the strongest chess players have spent about 5000 hours of serious study of chess on their own, whereas intermediate chess players practiced noticeably less (1000 hours). A study of Gobet investigates the value of Chase and Simon's chunking theory to help us design better teaching methods. This article will be summarized in a separate entry, as well as the one by Van Gog, Paas & Van Merriënboer, who study eye-movements to investigate expertise development. The special issue closes with an article by Ericsson in which new methods and directions for future studies are suggested. He concludes that in order to acquire superior performance of a task one has to do more than collecting knowledge. The development of expertise requires the acquisition of different representations, and of mechanisms that support planning, reasoning and evaluation. More insight is needed in the training and maintenance of these skills.

(Bregje Holleman)

F. Gobet (2005). **Chunking models of expertise: implications for education.** *Applied Cognitive Psychology, 19* (2), 183–204.

Simon and Chase (1973) offered the first general theory of expertise. Working from human information-processing theory they hypothesized that with extended experience

experts obtain a larger number of increasingly complex sets of knowledge (chunks) with more and more complex associations to other chunks in long term memory. The study reviews two computational models based on chunking mechanisms (chunking theory and template theory) and shows five insights they offer for instruction and training.

- Creating new chunks and links between chunks takes time. Time has to be invested to become an expert, and this time has to be spent on deliberate practice, not just practice in itself.
- Conceptual knowledge is based on perceptual skills and anchored in concrete examples. Ways should be developed to obtain perceptual chunks in a given domain. However, this can cause difficulties with transfer from the anecdote to the general domain.
- In order to encourage the acquisition of perceptual chunks, teachers have to segment the curriculum into components. This segmentation should be based on an analysis of the learning task and of the material and the skills to be obtained.
- Supplement the teaching of specific knowledge with the teaching of meta-heuristics, i.e. strategies about how to learn and how to monitor and regulate one's limited resources.
- Schemas and underlying regularities can only be acquired when there is input variability. If only a narrow range of problems is presented, this will impede the acquisition of an adequate variety of chunks and links connecting them.

The article also discusses the effect that curriculum sequence may have on learning, the effect of feedback on the acquisition of chunks and the role of individual differences in learning and instruction. The author calls for more theory-led research in education.

(Bregje Holleman)

T. Gog, F. van, Paas, J. Merriënboer (2005). **Uncovering expertise-related differences in troubleshooting performance: combining eye movement and concurrent verbal protocol data.** *Applied Cognitive Psychology, 19* (2), 205–221.

This study focuses on differences in knowledge and performance of individuals in the intermediate phase in the developmental continuum from being a novice to becoming an expert in a domain. What aspects of performance distinguish students at different (sub)levels of expertise? How does expertise develop in a complex cognitive task? Two techniques are used to trace the cognitive processes, a rather new one in this domain (eye-movement registration), combined with a widely-used method of measuring cognitive processes in this field (concurrent verbal protocol data) to analyze the expertise-related differences in troubleshooting performance dealing with malfunctioning electrical circuits between students at lower and higher sublevels of expertise.

The expectation that subjects with higher expertise would spend more time on problem orientation, and deciding on actions and evaluating them, was confirmed. Verbal data suggest that the lower expertise participants hardly oriented at all. It was not very clear how the fine-grained fixation data reflect cognitive demands: higher expertise participants tended to have longer mean fixations duration in most phases of troubleshooting, but did report a lower overall mental effort than the lower expertise subjects.

According to the authors, the results of their study suggest that the combined use of verbal-protocol data and eye-movement data is useful to enhance insight into cognitive processes. Verbal protocols reveal information on the content of cognitive processes, eye fixations data provide insights into processing demands and the allocation of attention.

(*Bregje Holleman)*