on experimentation), pragmatist (keen on trying out theories and techniques), reflective (tend to analyse) or theory based. Different presentation modes correspond to study recommendations based on students' learning style, but learners have the option to select modules in the order they prefer and thus are able to control the mode of presentation.

In three empirical studies the authors explored relationships between learning style, learners' preferences and interactions with both systems. These studies demonstrated that students differed in the way they select and study educational resources and that they found it useful to have multiple views available, but there was no clear relation between learning style and preferred mode of presentation. The authors raise several questions on how systems should suggest students select presentation mode, the validity of student self-reports on learning styles, and the ways in which systems may enhance students' learning style awareness during interaction. They recommend that systems should not base suggestions to students on their self reports but on automated analysis of learners' behaviour. Information describing this behaviour could be externalized to learners with the aim of enhancing their awareness of learning style.

(Leo Lentz)

V. Dupont and Y. Bestgen (2006). **Learning from technical documents: the role of intermodal referring expressions.** *Human Factors, 48* (2), 257–264.

Adding an illustration to an instruction may improve comprehension of the instruction and the usability of a device, but how do readers integrate the information coming from both text and illustration? In this article an experiment is reported that compared the effectiveness of two intermodal referring expressions: indexes (numbers introduced in the illustration and in the instructive text) and icons (visual representations of components of the device, inserted in the verbal instruction). Four kinds of instructions were produced by manipulating the type of referential expression (index or icon) and presence or absence of verbal description in the instruction. For example: an index without verbal description is *Press the button (7)*, while an index plus verbal description is *Press the connection cable button (7)*. A group of 104 participants performed three tasks: reading the instruction (text and illustration) on a computer screen, a sentence verification task to estimate the knowledge after reading, and a device utilization task to test their understanding of the procedure. The results demonstrated that there were only significant differences in the condition without verbal descriptions: reading efficiency was highest in the index condition, and the best performance with the device was found when participants had seen the icons. No differences were found in memory for textual instructions. The authors conclude that neither faster processing of the instructions nor poor performance in using the device was attributable to poor memory of the verbal instructions.

(Leo Lentz)

T. Seufert, F. Brünken (2006). **Cognitive load and the format of instructional aids for coherence formation.** *Applied Cognitive Psychology 20 (3)*, 321–331.

In the old days, learning was a one-medium activity, usually text-based. Nowadays, learning environments are multimedia and tend to combine a variety of representations, such as text, pictures, short films, tables, and formulas. In order to come to an adequate mental model of the information, a learner has to create coherence within each representation (local coherence formation),

and coherence between different but related representations (global coherence formation). Learners can use two strategies for coherence formation: they can rely on surface features and infer correspondence if, for instance, a word written in red can be linked to a red labelled part in a picture, or if a hyperlink relates different representations. They can also use semantic analysis and map a graphical representation of a chemical reaction onto a textual description of the same reaction because the same processes are recognized.

This paper investigates how different types of help for coherence formation affect learning performance and cognitive load during learning. Results show that surface level help for coherence does not enhance learning and increases cognitive load. This unexpected outcome may be due to the fact that the learning materials used in this experiment were rather complex, causing such an intrinsic cognitive load that the hyperlinks could only be used superficially.

Using deep structural level help should cause an increase in learning outcomes as it stimulates mapping activities. Only a small and insignificant effect was found, but learners who received this type of help did report a decreased cognitive load. Subjects who received both help types reached the highest learning scores and the lowest rates for cognitive load, but compared to a no help group, scores were not significantly higher. Nevertheless the authors advise to offer learners this combination of help because it seems to have synergetic effects: using both types of help took learners less time-on-task than processing each of them alone.

(Bregje Holleman)

S. L. Vanderstaay (2006). **Learning from longitudinal research in criminology and the health sciences.** Reading Research Quarterly, 41(3), 328–350.

Criminological and medical researchers have found that school success reduces the likelihood of criminal behaviour. By many accounts, behavioural difficulties co-occur with struggling to learn to read. Therefore, interventions aiming at heightening achievement are considered to be part of crime-prevention. This article reviews research that focuses on the link between reading and criminal, delinquent, or antisocial behaviour.

Some interesting facts: paying teenagers to graduate from high school would likely prevent five times as many crimes as imprisonment. U.S. teachers save their communities more than a quarter of a million dollars each time they keep one student from dropping out. The importance of reading is stressed by Williams and McGee (1994): they conclude that reading affects behaviour. This comprises hundreds of moments that are important for a child's development, and can result in a clear downward spiral.

What gaps need to be filled in this type of research, according to Vanderstaay? The view on the spiralling nature of the relation between reading and behaviour needs to be expanded with affective factors. Bonding (with teachers or peers) could be one of these factors. Also, hyperactivity is an important issue. In any case, the article stresses how dramatic the consequences can be of experiencing frustration and inadequacy in school.

(Judith Kamalski)