Does the practice of meta-cognitive description facilitate acquiring expertise?

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Expertise as Differentiation

How do people acquire expertise? Studies on machine learning in artificial intelligence have captured some aspects of human learning. But its limitation lies in that the representation of the target domain needs to be given in advance and fixed during the process in order for a learning mechanism to work. Contrarily, the ways people represent the external world evolve as they become experts. Experts are able to differentiate and perceive some features and relations in the world that would be meaningless to novices. This means that acquisition of expertise can be regarded as a process of becoming able to perceive what was not evident before. Gibson and Gibson (1955) described a similar process, in relation to expertise, in their case, wine-tasting: "Perceptual learning, then, consists of responding to variables of physical stimulation not previously responded to" (p. 34). The expertise-as-differentiation view was not necessarily discussed in studies on chess in which expert performance was explained by chunks (e.g. Chase and Simon, 1973).

Our previous studies on expert-novice differences in design showed similar findings. Designers draw sketches in the early design phase. Sketches are not only a record of generated ideas but also a stimulus for new ones. The success of a design process hinges on differentiately perceiving features and relations in sketches and generating interpretations of them. We found that expert designers were more capable of associating features and relations with functional issues (Suwa and Tversky, 1997). Further, perceiving features and relations unheeded before, which is difficult to do for novices, was the major driving-force for the generation of ideas for an expert designer (Suwa, 2003).

Hypothesis: The Practice of Meta-cognitive Description will Foster Differentiation

Then, what kind of cognitive practices in a target domain help become able to differentiately perceive features and relations in the external world and interpret them? We have made a hypothesis that self-awareness of and thereby meta-cognitive descriptions of what one has perceived and conceived of will foster the ability of differentiation and thus facilitate acquisition of expertise (Suwa and Tversky, 2003). Anecdotal evidence comes from the domain of sports. A Japanese player in Major Baseball League, named Ichiro, said in a TV interview that it is through a persistent effort of describing how he has perceived the ball and how his body has reacted and hit it that he had become one of the most productive hit-maker. Our finding (Suwa and Tversky, 2003) that expert designers are better at a meta-cognitive skill of reorganizing perception and generating interpretations than novices is also supportive.

We have recently obtained empirical evidence from the case study of singing a song. A participant in the experiment continued to sing a song for 4 months, recording his voice in every trial of singing. During the period, he continued describing meta-cognitively, in the form of writing in a notebook, how he was utilizing his throat, breath and tongue and how that helped express his feeling and emotion. Evaluation of all the trials of singing by three musicians after 4 months revealed that his performance exhibited a U-shape learning curve, i.e. getting better in the beginning, then turning worse sharply and gradually getting better and better toward the end. This indicates that he was climbing steps toward acquiring expertise. An interesting finding is that the evaluation scores of the recorded songs correlated in a statistically significant manner with the amount of meta-cognitive descriptions accumulated for about one month up to the time of every trial of singing. This suggests that the practice of meta-cognitive description had a latent effect, not an instant one, on his performance.

We interpret this in the following manner. A meta-cognitive description is a kind of narrative created by self. Its validity is not assured anyhow. Important is, however, the practice of meta-cognition itself, not its validity. A meta-cognitive description as a narrative will effectively drive differentiation of features and relations in the external world, and thereby encourage the next cycle of meta-cognitive description. This cycle will lead up to acquiring expertise.

Acknowledgments

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