**Book Review**

*Design Knowing and Learning: Cognition in Design Education*


To start a development of a ‘science of learning’ seems an almost impossible mission. Nevertheless, by presenting this book the editors showed the courage to undertake this difficult expedition. They brought people together from different design fields who are seriously involved in design education. In my review I want to focus on the question of whether this courage has been rewarded by the joint contributions of the authors involved.

Let me start by saying that the book is a valuable and significant contribution to design research in general. For everyone who wants to get a fairly complete overview on what happened in recent years in empirical design thinking research, the book is a must-read. Almost every area relevant to design cognition has been covered, from purely behavioural aspects such as mental representations, the role of prior knowledge and visual reasoning, to general design processes and strategies. But it offers more than cognitive aspects alone. I am very happy with the attention paid to evaluating the research methods applied in this area as can be found in the chapters by Craig (chapter 1), Cross (chapter 5) and Bucciarelli (chapter 13). Especially the first chapter by Craig contributes to the maturation of the design research field by giving a rather critical view on many current design studies. Much of his criticisms can be applied to a number of contributions in this book.

But, what about the development of *design learning strategies* and *design pedagogy*? Unfortunately, that seems to be not the real focus of the book. Most chapters hardly contribute to a better view on this pedagogy and learning strategies in design education. In that way the book reflects the editors’ disappointing experiences in earlier efforts to find authors for a special issue of *Design Studies* on design learning. The two main problems they encountered were the lack of rigorous evaluations of innovative classroom interventions, and the lack of clarity in determining the gains in student performance on the basis of the learning method applied.

I miss an overall introduction to the topic of design learning. Although there are differences between designing and other disciplines, the way students acquire knowledge and practical skills is quite common among most disciplines. For that reason we can learn from learning theories and research data already developed in other disciplines such as educational and cognitive psychology. I disagree with Oxman’s statement in Chapter 12 that ‘...there presently exists a lack of educational theories of learning which function as an underpinning of design education.’ A lot of (rigorous) research has been done on knowledge acquisition and transfer, on the importance of different knowledge types (declarative, procedural, meta-cognitive), on information processing and on skill learning; but also on the effectiveness of teaching/learning methods. All these findings can contribute to the development of design pedagogy.
That is not to say that in the book there are no references made to these findings. For example, Goel’s description of the importance of Type 1 knowledge (domain-related and technical) and Type 2 knowledge (managing the process of design) has strong relations with well-known learning theories; the same holds for the theoretical view of Newstetter and McCracken on prior knowledge in design learning. But again, in their empirical research and conclusions a translation of these data in terms of consequences for design education is missing.

Regarding the issue of design pedagogy it seems quite obvious that more research is needed in the classroom. But I know from my own experiences that it is indeed very difficult to derive rigorous data from classroom experiments and observations. As a consequence of the many variables involved, there is too much noise obscuring the data. But here also we can learn from the research in other disciplines in order to develop our own research methods on design learning.

The editors see the book as an ‘initial step’ towards the development of a science of design learning. Even if we limit ourselves to the development of design learning strategies, the initiative taken by the editors certainly deserves a sequel.

Henri Christiaans