Education, Design and Practice – Understanding skills in a Complex World

• Paper / Proposal Title:

**SHARED MENTAL MODELS & ZPD IN TEACHING & LEARNING ARCHITECTURE**

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• Abstract (300 words):

Scholars agree that architecture cannot be taught in the traditional ‘frontal teaching’ mode, as architectural design involves sharing knowledge and skills which cannot be fully explained. Nevertheless, one can learn how to think like an architect by learning-by-doing, a process usually performed under a ‘coach’ in a studio setting. The coach accompanies and guides the students, however, cannot ‘teach’ exactly how to solve architectural problems. The student-coach team therefore relies on Shared Mental Models (SMM) which allow a common basis for formulation and acquisition of complex declarative and procedural knowledge, jointly producing ‘designerly ways of knowing’. SMM enable bridging the student-coach knowledge gap and establishing a Zone of Proximal Development (ZPD), characterized as the distance between problem solving abilities exhibited by a learner working alone and these abilities when collaborating with more experienced others.

This research studies, characterizes and compares mental models shared by student-coach teams in the 1st and 3rd year studios in an architecture school (n=22).
Teams include a coach and in the 1st year a novice student, and in the 3rd year an advanced beginner student. The research’s main contributions include:

1. A taxonomy of shared mental models in the studio is presented, clarifying the nature and evolution of the knowledge exchange in the student-coach team.

2. Common or extended ZPDs are discovered in both years studied, evolving from a ‘coach-centric’ ZPD in the 1st year to a ‘student-centric’ ZPD in the 3rd year.

3. The concept of sharedness Levels (SDlev) is introduced, elucidating the differences and development in SMM from 1st to 3rd year studios; and

4. A new concept of Scaffolding space is formulated, providing new insight on development of SMM by means of rapid and seamless transition between different and synergetic scaffoldings, enabling the learner to bridge the gap between potential and actual development.

• Authors' Biographies

Lee Ariav is an Adjunct Lecturer teaching at the Faculty of Architecture at the Technion - Israel Institute of Technology, Haifa for approximately 15 years. He trained as a landscape architect at the Technion, Haifa and spent a decade in private practice. He earned his Masters degree in Architecture and Urban Culture from the Universitat Politècnica de Catalunya, Barcelona Spain. Subsequently, while teaching in Israel and as a visiting academic abroad, he completed his PhD at the Faculty of Education in Science and Technology, Technion, Haifa, focusing mainly on the first formative year of the students’ education, studying knowledge sharing and pedagogy in the architectural studio. Applying qualitative research methods, his research applies Vygotsky's ZPD structure to the studio, revealing the nature of development in shared mental models from the 1st to the 3rd year studios.

Prof. Gabriela Goldschmidt is a Professor Emerita in the Faculty of Architecture and Town Planning at the Technion – Israel Institute of Technology. She holds a M.Arch degree from Yale University and has served as a visiting professor at MIT, Stanford University, TUDelft, Ulsan National Institute of Science and Technology in South Korea, The University of Montreal, and Bezalel Academy of Art and Design. Her research interests include design cognition and reasoning, design education, and visual thinking, with an emphasis on representation, analogical reasoning and sketching. Gabriela is the author of a large number of research journal and conference papers, many book chapters, and two books, the later one being Linkography: Unfolding the design process (MIT Press, 2014).
Dr. Tali Tal is an associate professor and the head of the informal science and environmental education research group at the Faculty of Education in Science and Technology at the Technion. Dr. Tal is the President-elect of NARST, A Worldwide Organization for Improving Science Education Through Research. Her research focuses on learning science in informal settings, inquiry-based learning, environmental education and learning with socioscientific issues. She has published 60 papers in prestigious research journals such as the Journal of Research in Science Teaching, Science Education, Environmental Education Research and the International Journal of Science Education, and numerous book chapters that deal with her topics of interest.