A new representational ecosystem for design teaching in the studio

Tomás Dorta, Gôkçe Kinayoglu and *Sana Boudhraâ*, Design research laboratory Hybridlab, University of Montreal, J.-A. Bombardier Building, Room 4027, 5155, Decelles Av., Montreal, Quebec H3T 2B1 Canada

Simulation tools available in a design studio can be named Representational Ecosystem. It exists a variety, balance, exchange and interoperability amongst the elements of this ecosystem. Due to the monolithic approach introduced by generic 3D modelling software, which neither considers the multiplicity of representations nor facilitates abstraction, the current 'digital' paradigm fails to effectively support the co-design process in design teaching in the studio. This paper presents a case study that analyses the utilization of an immersive co-design environment called Interconnected Hybrid Ideation Space, amongst other kind of representations, during an undergraduate design studio. The epistemology and principles of this new representational paradigm for teaching the design studio are described: being bilaterally-hybrid, supporting multiple representations and scales, and fostering co-design.

Keywords: design education, collaborative design, virtual reality, design tools, representational ecosystem

The conventional workflow in the design teaching studios has been disrupted due to the widespread and premature introduction of computers and laptops as a substitute for the representational environment for design. This transition has been traumatic to the studio environment because the current digital paradigm largely ignores the gap between the traditional and digital tools of representation. We believe that there is a need to envision a new digital paradigm better integrated with the broader representational environment of the studio.

The design studio houses a variety of media acting as a *Graphical Simulation System* through which design intentions are exteriorized (Lebahar, 1983) for learning purposes. Visual media such as sketches, concept diagrams, plans, sections, elevations, perspectives, are accompanied by physical mock-ups and models, which are employed in simultaneous or progressive manner throughout the design process, while the project unfolds from initial exploratory concepts into finalized production drawings. In this paper we refer to the entirety of these different representational media as the *Representational Ecosystem*, because of their plurality and inter-supportive nature. This

Corresponding author:
Tomás Dorta
tomas.dorta@umontreal.ca

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ecosystem, allowing multiple forms of externalization, discussion, and evaluation of the design ideas, is the epistemological context within which the participants of the co-design process (students, professors, clients, and collaborators) reflexively engage in the design development, teaching and learning (Schön, 1992).

The collective nature of the design studio supported by intuitive forms of visual and verbal conversation has been hindered by the introduction of the personal computer and more recently with the widespread utilization of laptops. Digital design and representation software need, in most cases, a high degree of specialization and this seems to encumber the co-design process and the knowledge transfer. This is because computers do not allow synchronization of reflexive design conversations with their related representations (externalization), or utilization of abstract, inaccurate and ambiguous representations during ideation discussions.

Another important factor to consider is the scale and the ways in which it is used in analog and digital forms of representation. Professional practice utilizes standard scales whether they be Metric (1:50, 1:200, etc.) or Imperial ($1/8'' = 1'-0''$, $1/4'' = 1'-0''$, etc.) because the scale of a drawing on paper is a crucial component for the communications during the development of the project. In addition, it is not only a geometric relation between the size of the drawn object and the real one, but also a grammatical convention that determines the type and amount of information that should be presented in a particular drawing. In digital media, scale becomes a concept that is purely geometric and not semantic: the representational language. Drawings are often created in 'full scale' (in terms of drawing units), however they are viewed in an arbitrary and fluid zoom factor on the screen or projector. The result is a total loss of reference and scale-awareness for the design student: One is left without a sense of a limit for how much detail needs to be depicted in a drawing, nor a robust comprehension of the actual physical size of the designed space or object in relation to its drawn image.

In disciplines such as architecture or interior design, representations only simulate the proportional relations of the design solution but do not deliver a first-person experience. Life-size models or imagery are not commonly encountered. While scaled representations are important tools for design, being able to achieve a full-scale, immersive understanding of the design object could greatly facilitate the creative process and help to make better collaborative design decisions. The lack of full-scale representations is an obvious deficiency for these disciplines, however this is equally true for those dealing with smaller or larger scales, such as industrial design and urban planning.

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