

Application of Theory of Inventive Problem Solving (TRIZ) in architectural design studio

Summary

The design studio is the core of architecture education and its models focus on learning by doing. Albeit several benefits are recognized in the application of design studio as a tool for solving design problems, the design studio educational method remained unaltered in the last century. Since its onset, there has been a controversy in design research between applying creative-intuitive or rational-systematic design methods and their combination. Most systematic methods have emphasized the rationalization of the design process. In one hand, systematic methods may decrease the number of mistakes and trials and errors in solving design problems; in another hand, students may ignore their intuition abilities by just using systematic methods. Some resistance remains in the application of systematic methods in architectural faculties and architectural design studios. One reason for this resistance could be the lack of evidence supporting the usefulness in applying such methods to solving architectural design problems.

TRIZ is the Russian abbreviation of what can be translated as "Theory of Inventive Problem Solving". It was developed by Genrich Altshuller (a Russian scientist and engineer, 1926–1998) and his colleagues. TRIZ provides the possibility of using systematic methods as a tool for identifying and eliminating the contradictions inherent to the design processes and also to improve innovation processes. This study aimed to develop a framework for the application of the TRIZ theory as a systematic problem solving method to architectural design studio. This work aimed to experimentally identify which aspects of architectural design solutions are statistically influenced by the choice of systematic method used. Specifically, design studio environment tests were developed to compare solutions that resulted from the application of systematic and non-systematic methods to the architectural design process. For this purpose, testing workshops were divided into two sessions: non-systematic session in which students were free to use the knowledge acquired previously in their training, and a systematic session in which students applied TRIZ. Furthermore, the workshops were organized in two types: in the first workshop, the same participants experienced both a non-systematic and systematic-session, while in the second two different participant groups were used.

Three tools were applied in the TRIZ session including contradictions, 40 principles and Substance-Field. Both sessions featured a problem for which each solution created within the two sessions was assessed by three peers and three experts. Their evaluation was supported by 11 criteria adapted from evaluation techniques identified by literature review. The 11 criteria incorporate aspects such as design idea originality, complexity, feasibility and functionality, using knowledge of different industrial areas (e.g. mechanical, electrical and software engineering) during design, and other idea evaluation criteria adapted to the architecture context. Data was analysed with One-way Repeated Measures Analysis of Variance (ANOVA) to test for significant differences in the assessment scores of the 11 criteria in peer and expert evaluations between systematic and non-systematic sessions. For most criteria and comparing peers and experts' assessments, the systematic sessions assessments were statistically higher than those of the non-systematic sessions.

Overall and based on the questionnaires applied, students and professors rarely use systematic methods such as TRIZ. However, the application of TRIZ significantly increased the level of novelty of design solutions. TRIZ cannot replace students' natural intuition and creativity but it proved to be a very useful supporting them in defining and solving design problems. In terms of tools, the Su-Field analysis helped students to define and understand design problems, while contradictions and 40 principles helped creating new solutions. Through the adaptation of some of the parameters and principles into an architectural framework, students would be able to apply TRIZ as a very efficient approach to solving design studio problems.

Keywords

Architectural design studio, TRIZ, problem solving, design methods, design research.



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