

Selected elements of synectics in architectural design studio

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ABSTRACT: The prospective architect-engineer must become familiar with the complexities of their future profession. However, this familiarity is only a starting point, as one of the main goals of architectural education is to encourage and stimulate the creative thinking of future professionals. Nowadays, innovative knowledge should be at the core of education provided to engineering students. To introduce students to a difficult or unfamiliar concept, synectics is used. It is a problem-solving methodology that uses connections between seemingly irrelevant elements, allowing the creation of new solutions that were previously disregarded. In the article, the author discusses the proposed use of synectics in architectural design education. The *compressed conflict analogy* of forms and the *forced fit* of functions serve as tools of architectural design education in the Faculty of Architecture at Cracow University of Technology, Kraków, Poland. The completed design topic *Car Park-Theatre in Wieliczka* is presented as a result of the implementation of this approach.

INTRODUCTION

The process of architectural design education requires an initial reduction of actual design problems. In more advanced years of study, the student is confronted with increasingly complex issues that require the simultaneous analysis of several intricate topics, related to technical, technological, functional and spatial or social and cultural aspects. As Żychowska concluded:

It is clear that the future architect-engineer must become familiar with complexities to be met in their future profession, and these complexities are a necessary focus on the curriculum in education [1].

However, this familiarity is only a starting point, as the aim of teaching future architects is to foster creative thinking, which should lead to innovations. Creativity should be considered as a process rather than a product as it enables innovation. Whereas creativity is to be seen as an imaginative process, innovation is a productive process with a final result. Pusca and Northwood noticed that curiosity and creative skills are the pillars of academic knowledge and its application in the real world:

These are some of the most valuable skills that engineering graduates should possess as they prepare to enter the global economy. As professionals, they will need to innovate and find better solutions to diverse problems that exist in our society [2].

Nowadays, innovative knowledge should be imparted to engineering students to enable them to adapt to new technologies and changing markets. Furthermore, educational programmes must be tailored to the needs of the global market. Labour market research indicates a shortage of highly qualified specialists in areas where interdisciplinary competencies and a broader scope of knowledge are required [3].

Fostering competencies, such as creative thinking and an analytical approach are essential to enable students to solve problems in the professional sphere. Architectural education should allow students to solve complex design problems creatively. Lüley points out that non-linear design thinking in architectural education can lead to a new understanding of contemporary sustainable design [4]. He notices that architectural design based on a strict typology, using *preconceived spatial organisation, solutions and tectonic systems ... is often limited by a set of formal and structural constraints rooted in the functionalist and modernist tradition [4].*

Furthermore, mono-functionalism and a standardised perception of architecture lead to limited spatial outcomes, costly refurbishment, demolition and environmental pollution. It is necessary to introduce new methods to architectural education. Synectics, a problem-solving strategy, can yield successful educational outcomes.

SYNECTICS AS A METHODOLOGY

Synectics is a problem-solving methodology that uses connections between seemingly irrelevant elements, allowing the creation of new solutions that were previously disregarded. It was co-developed in the 1950s by George M. Prince and William J.J. Gordon when they worked at a consulting firm that helped companies develop new product concepts [5]. They transformed their observations into methods that reflect the techniques employed by successful entrepreneurs and inventors.

Gordon established three maxims of synectics theory: as people become aware of the psychological processes that influence their behaviour, creativity increases; the emotional part of creative behaviour overshadows the intellectual component; and the emotional and irrational elements should be understood and used as tools to enhance creativity [6]. Irrational aspects can be understood and controlled consciously using two synectics objects: metaphor and analogy.

The metaphor is the process of building a relationship of similarity, the comparison between an object/idea with another object/idea, placing the first object in place of the other object/idea. The second synectics object is the analogy. There are three forms of analogy that are used in synectics: personal analogy, direct analogy and compressed conflict. Conflict compression reflects students' ability to combine two sets of cues with one subject. The greater the distance between the two terms, the greater the mental flexibility [6][7].

There are two synectics-based learning strategies or models that work through the use of analogies: *To make the strange familiar and the familiar strange*. Tassoul explains the idea in the following way:

Learning and creating often happen by trying to apply existing knowledge to situations and problems not yet encountered. By looking for connections between the known and the new, we can find similarities or analogies. And once a first understanding is acquired, like a bridge, now unfamiliar elements in the new can be placed more easily, and an understanding can grow [8].

Synectics today is a set of process tools that can be successfully applied in a variety of situations, either in a specific sequence (as in the original invention model) or individually, as required by the situation. *The result is a variety of meeting models and techniques for enhancing personal effectiveness [9].*

A successful learning experience that involves synectics derives from the ability to create physical, symbolic or behavioural connections between the foreign and the familiar. In general, people try to make sense of the unknown by examining the situation through well-understood perspectives. Synectics disrupts this normal pattern of thought.

Tassoul finds *force fit* a very important creative mechanism that is much more difficult than simple associative thinking [8]. As an example, he connects a fountain pen with an elephant, which at first may seem absurd. He explores this connection further and compares the clasp of a fountain pen to the trunk of an elephant. He then suggests using this clasp as a trunk, drawing ink from a reservoir, and not getting inky fingers when refilling the fountain pen. He takes this a step further, by association, and proposes using the clasp as a pump. This way he explains the mechanism of how making these connections leads to completely new approaches to a familiar problem. Koestler coined the term bisociation to describe this mechanism of connecting two concepts that have nothing in common at first sight, but on closer examination connections can be discovered, whereby new perspectives on the original issue emerge [8][10].

Synectics is widely used in education to introduce students to a difficult or unfamiliar concept. Research findings by Kalantarnia et al indicate that the introduction of synectics patterns exhibited significantly more impact on students' creativity, creative problem solving and performance in geometry compared to traditional teaching methods [11]. They argue that the use of educational patterns appropriate to the educational content will lead to the training of creative people, while the teaching methods applied are directly related to the growth of students' creativity [11][12]. The researchers concur that creative thinking and metacognition skills are absolutely essential. Metacognition and creative thinking skills must be stimulated and fostered at the higher education level to enable the use and further development of professional creative potential in the future [13][14].

CONFLICT COMPRESSION IN THE CONTEXT OF ARCHITECTURAL DESIGN STUDIO

The presented method that incorporates the elements of synectics is employed in architectural and urban design classes for third-year undergraduate students and first-year graduate students in the Faculty of Architecture at Cracow University of Technology (FA-CUT), Kraków, Poland.

The method is based on the assumption that creativity among students in more advanced years of study, when design becomes more complex, can be encouraged by the departure from patterns, familiar typologies and mono-functionalism. Therefore, the method draws on the above-mentioned principle of synectics that uses connections between seemingly irrelevant elements, allowing the creation of new solutions that were previously disregarded. The students are given the task of designing a structure consisting of two seemingly incompatible spatial and functional components.

The compressed conflict analogy is used here. The juxtaposition is to provide a potential solution to the problems, needs and possibilities of the site where the structure is to be located. The topic is selected in such a way as to reduce the initial problem (e.g. function-site conflict, form-site conflict) to its basics and then introduce a new element related through subsequent analogies (chain analogies).

To prepare for the task, the students conduct a typological analysis of each component, identifying their similarities and differences. They redefine these parameters freely to exploit the potential of the components and the site simultaneously, drawing further analogies. Based on them, they develop architectural concepts (build physical models, draw) following the *forced fit* mechanism of the synectics process (Figure 1). Thus, they cannot directly use familiar patterns, but have to process them and establish new connections.

The concepts are eventually validated by examining the qualities of the solutions against known systems and the identification of design innovations.

The following projects based on this method have been implemented in recent years in co-operation with the municipality of Wieliczka, Poland: bus station/information box, market place/concert hall and car park/theatre.

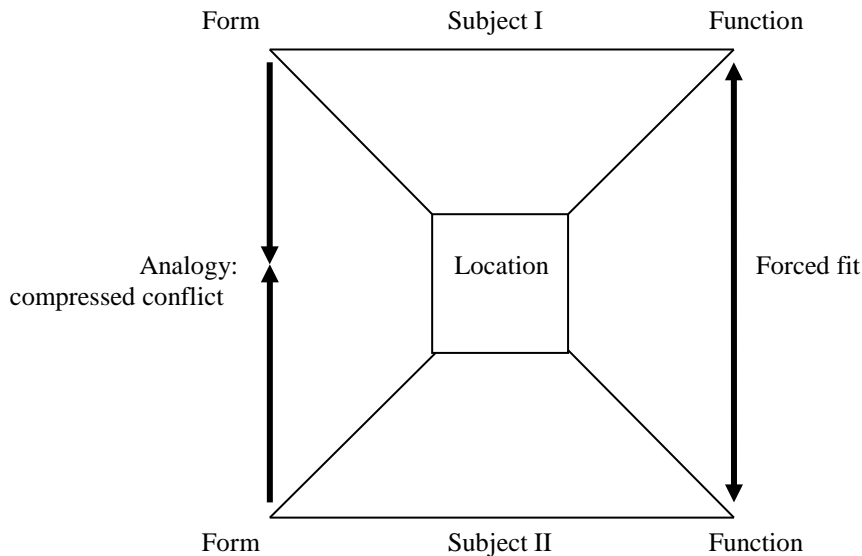


Figure 1: *Compressed conflict analogy* of forms and *forced fit* of functions as tools of architectural design education.

ANALOGY-BASED PROJECT: CAR PARK/THEATRE IN WIELICZKA, POLAND

In the 2018/2019 winter term, the task given to a group of students from the FA-CUT architectural design studio was the *Car Park/Theatre* project. The principles of synectics and the compressed conflict analogy approach were employed. The project was implemented in co-operation with the municipal authorities of Wieliczka, Poland. The town is visited by almost two million tourists a year who come to see the Salt Mine. All the car parks in the town centre are very expensive and mainly serve tourist traffic.

At the same time, Wieliczka as a satellite town of Kraków has its residents commuting to work there every day. The cities are connected by a high-speed railway network, and park-and-ride facilities are essential. Thus, the municipality decided to explore the possibility of building a multi-storey car park at the existing above-ground car park in the vicinity of the Wieliczka Park station.

This was the topic presented to the University. However, the preliminary analysis of the topic indicated the need to develop a public space in this area, close to a park, a leisure centre and a residential area. How to turn a multi-storey car park into a public space? It was found that the car park would be used primarily on weekdays. At the weekend it would remain empty. If there were no car park, what public facility could exist there? What function would bring people together on their days off? A show. There is no theatre in Wieliczka. A theatre then.

This chain analogy led to the final result - a compressed conflict - car park/theatre that the students were expected to tackle. To turn the topic of the theatre into a more viable problem, the task of designing a stage set for Alfred Jarry's drama *Ubu Roi* was introduced. The students were given the freedom to come up with solutions based on a formulated individual understanding of the task. This understanding required the analyses of various spatial, functional, technical and technological aspects of both the car park and the theatre. The students also conducted theoretical studies on contemporary theatrical space. This involved examining and rethinking theatrical spaces and buildings, analysing their function, architectural form and significance in the urban fabric. They redefined this data by building physical models and sketching, thus creating further analogies.

The need to juxtapose such two different structures with each other required establishing new connections and processing schemes. Architectural concepts were assessed with reference to known systems and the identification of innovations. The students had to decide on the best solution themselves; the project was conducted in the form of a competition. A study confirmed that architectural competitions also enhance students' creativity [15].

The winning entry was to be sent as a proposal to the 2019 Prague Quadrennial Studio: Common Design Project. Its curators invited the international community of design for performance courses to set *Ubu Roi* as a studio design project (conceived for any theatre, whether traditional proscenium, small and immersive spaces, found space projects, etc). Only one project from participating design courses could be submitted for consideration by international curators, and the projects' authors selected by the curators were invited to bring their work to Prague for a joint exhibition and to have their concepts reviewed by leading practitioners.

The CUT students selected Filip Jakubczak's project (Figure 2). It was one of 14 projects distinguished and selected from 65 submissions from all over the world that took part in the Prague event. The space designed by the student is a five-storey car park in the form of a spiral ramp, with its lowest level acting as a theatre and the light of the spiral taking over the function of the fly space. The stands are organised around a circular revolving stage and on the inside of the parking ramp. The author himself described the project in the following way:

The garage theatre alludes to the life of the inhabitants of Wieliczka, a satellite town of Kraków. It reflects the problem resulting from constant mobility that inhabitants working outside the city are often forced to face. Due to spending so much time in their cars, they have no time for culture. The solution to this problem becomes a car park that takes on the function of a theatre while the drivers become the audience of the performance upon driving into the building. The stage design transforms the entire building into a stage, changing the rules of the performance. Instead of gongs, one can hear the engine's whirr, the car headlights become the lighting, and the concrete walls of the car park become the projection surface. The giant sphere, which symbolises the suppressed anger and frustration of the inhabitants of the town, pushes its way through the light of the tunnel towards the stage while the audience moves around the ramp along with it. Once they reach the top, the performance begins [16].

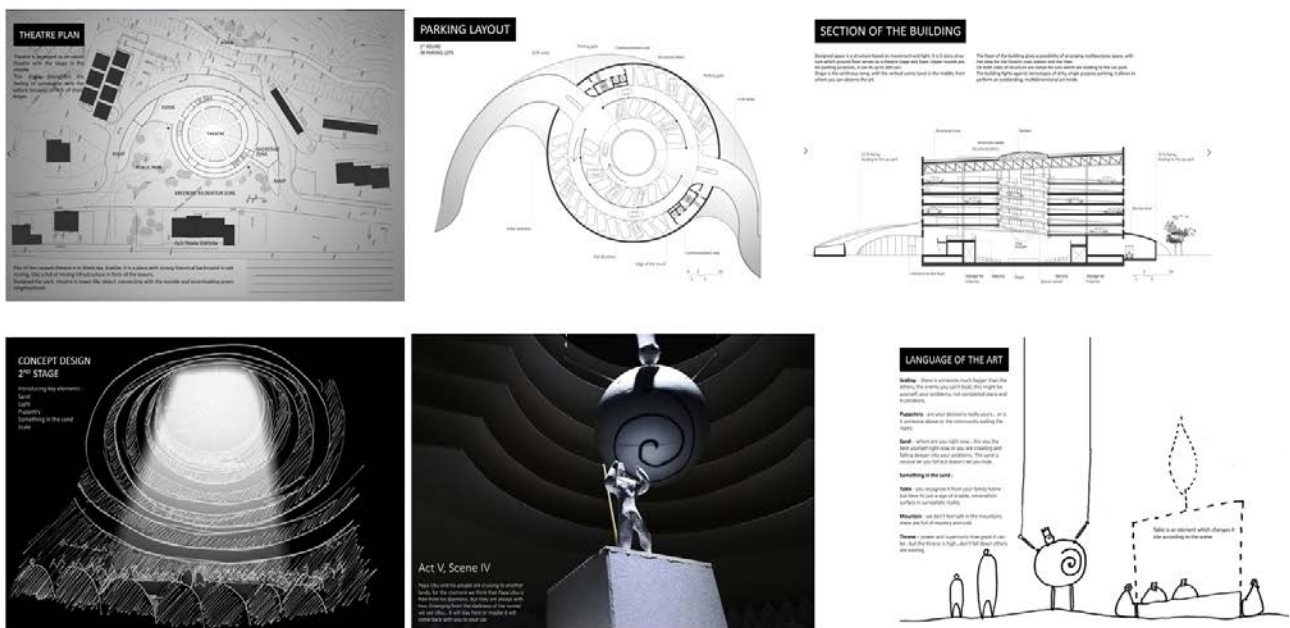


Figure 2: Car park/theatre in Wieliczka, FA-CUT architectural design studio 2018/2019, student: Filip Jakubczak. The project presented at the 2019 Prague Quadrennial: PQ Studio: Common Design Project *Ubu Roi*.

DISCUSSION AND CONCLUSIONS

As a problem-solving strategy, synectics is primarily used in group discussions, often held by experts from different fields, contrasting different points of view. The process of drawing sequential analogies and juxtaposing them is also employed in education at various levels. Research has shown that this method can enhance students' creativity more effectively than conventional methods.

Creativity lays the foundation for innovation, which is extremely important in the modern world, especially in engineering sciences, including architecture. The introduction of synectics or its derivative elements fosters an educational process that no longer focuses directly on the acquisition of knowledge about complex architectural systems and the ability to implement patterns. Instead, the knowledge that students acquire underpins their critical thinking and should result in the ability to generate new ideas and solutions.

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