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Methods and techniques supporting creativity in architectural education

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ABSTRACT: Creativity is not a predetermined ability of only some people. Everyone has a certain degree of creativity that can be developed and supported to a large extent. In architectural design, the need for critical thinking has to coincide with the support of creativity. Architectural creation has its tools, techniques and processes, and in architectural education appropriate methods have to be employed to support creative thinking, which can fundamentally help students to target their creative efforts in a more measured and effective way. In this article, various possibilities of using these methods in the educational process are explored, depending on individual student characteristics. Further, it is argued that the focus on the individual and knowledge of the student's learning style can enable the appropriate application of the methods and techniques for creativity development and support. This approach will prove more beneficial than the general use of techniques supporting creativity. Also, such an approach and the concept of creativity must be key factors in new teaching strategies and curricula of architectural design.

Keywords: Creativity, methods supporting creativity, architectural education, teaching strategies

INTRODUCTION

According to the World Economic Forum (WEF), which publishes job skills forecasts, among the top ten skills included in the 2020 report [1] were: comprehensive problem-solving, critical thinking and creativity [2]. The importance of creativity in the educational process is also documented by an EU study, which maps the methods of creativity and explains its importance at the very beginning of this process [3].

Creativity is not a predetermined ability of only some people. Everyone has a certain degree of creativity that can be developed and supported to a large extent. In architectural design, the need for critical thinking has to coincide with the support of creativity. When thinking critically, one pays close attention to the topic and uses precise techniques to get the right answer. Critical thinking is convergent and focuses on one specific thing. Creative thinking is different. It starts at one point and explodes outwards into several possibilities.

Although the term creativity has many meanings and definitions, in the most general sense creativity can be understood as a *concept and the ability to bring new ideas*. Creativity has the following basic characteristics:

- Flexibility - when one eagerly works with any concept.
- Fluency - quick discovery of many ideas.
- Originality - constantly creating new possibilities.
- Elaboration - constantly developing one idea for more.

CREATIVITY AND ARCHITECTURAL DESIGN

Every creation has its tools, techniques and processes, and it is good to know about them at the right time. No methodology hampers creativity: on the contrary, many students can get the fundamental help they need to direct their creative efforts in a more targeted and effective way. Architecture belongs to those areas of creation the paradigm of which is changing very dynamically. Today's architecture is undergoing paradigm shifts in such a rapid sequence and frequency that has never been experienced before in human history. The mind of an architecture student, therefore, needs to be systematically trained to think *in a way that presupposes*, not only from the aesthetic point of view, which is the external expression of architecture, but from the point of view of conceptualisation, which is the inner core of architectural design [4].

Horng et al argue that the concept of creativity must be a key factor in new learning strategies and curriculum design [5]. Although there is a consensus on the necessary introduction of the concept of creativity in higher education, the question remains which of the existing methods to support creativity are most suitable for architectural creation, and respectively, whether the question posed can be answered unequivocally. The goals of new ways of teaching design often focus on enriching a pure artistic vision of architecture through the incorporation of scientific knowledge and social responsibility. The architectural design of the present is no longer determined only by aesthetic questions. Environmental comfort and the issue of sustainability have increased the need for exact science and technology education. The social sciences must instil sensitivity to the relationship between human behaviour and the elements of the built environment.

Architectural design has its obligatory phases:

a) Starting phase: data gathering, problem and site analysis, precedent studies.
b) Ideas generation phase: variations of concept and design speculation (imagining) - trying out alternatives.
c) Ideas evaluation phase: correction and elimination (representing).
d) Project presentation phase: public review of design and discourse (testing).

Although the idea (its generation and evaluation) seems to be the most important aspect of the design process in terms of creativity, equally important is the initial phase where the constraints and limits of the assignment are examined. An important factor stimulating creativity is the introduction of restrictions [6].

There are limitations in the building design process through codes, site conditions and costs, to mention just a few aspects. Although constraints are often seen as an aspect that suppresses creativity; constraints can also be a positive challenge for new ideas to flourish. Restrictions as stimuli can be applied in a design study to encourage students to break down imposed barriers through creative and appropriate solutions (see Figure 1).

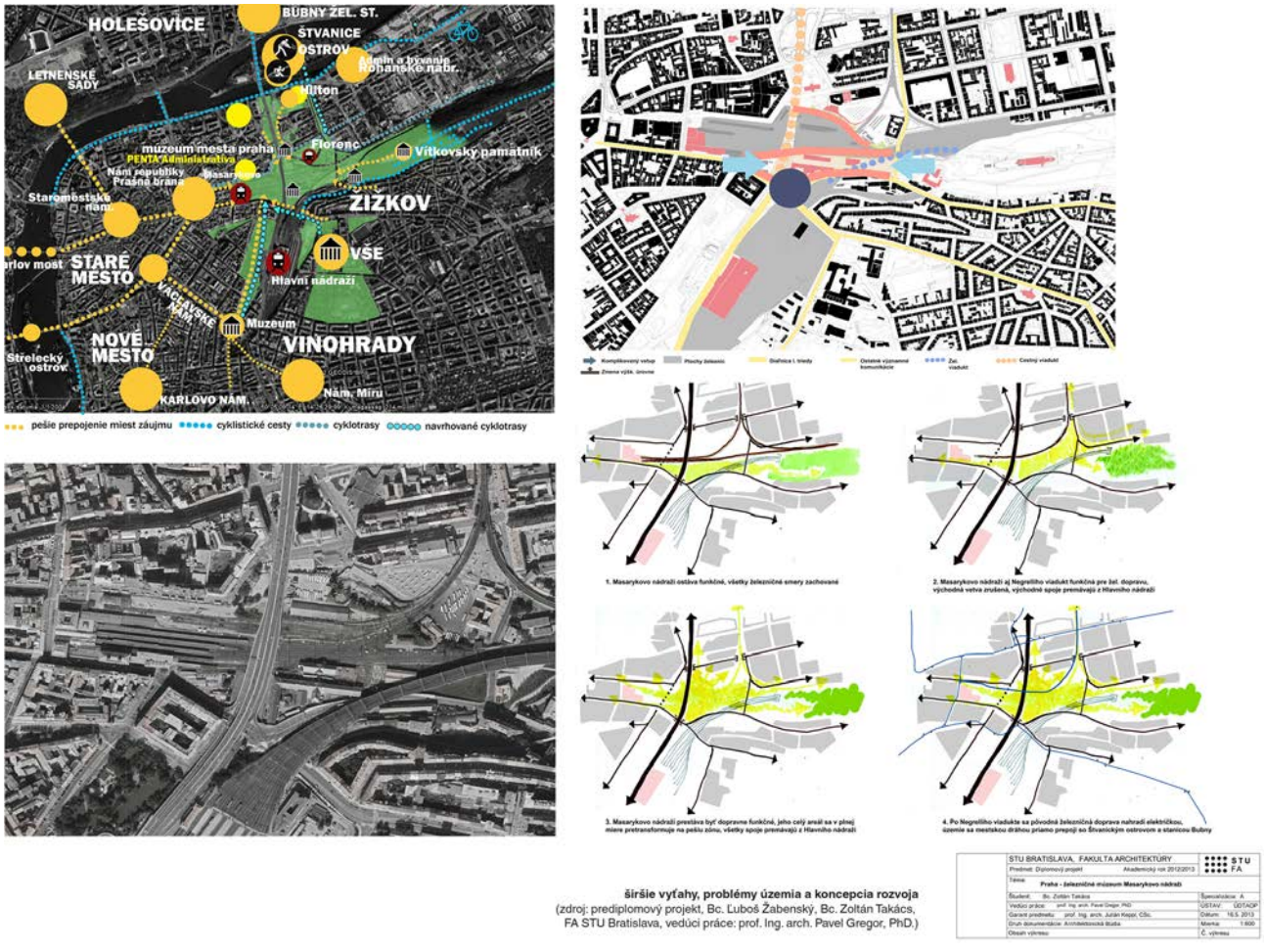

Figure 1: Analysis of the limits and potentials of the focus area (diploma project: L. Žabenský and Z. Takács; supervisor: P. Gregor; part: broader relations, territorial problems and the concept of development).

Studies on the creative thought process have established that it depends on the characteristics of an individual, including: receptiveness or attitudes in search of new and appropriate solutions, immersion into the problem at hand, dedication and motivation, questioning attitudes, analysis of ideas, with special attention to flawed solutions [7]. Knowledge of the student's learning style can enable the teacher to choose the appropriate creativity technique, which in terms of the result will prove to be more beneficial than the use of general techniques of creativity. In general, four student learning

styles can be identified, for which Kolb uses the terms: diverging (CE/RO), assimilating (AC/RO), converging (AC/AE) and accommodating (CE/AE) [8]. In these learning styles CE refers to concrete experience, RO to reflective observation, AC to abstract conceptualisation and AE to active experimentation.

1. *Diverging (feeling and watching* - CE/RO) - learners tend to look at and assess things from different perspectives; display emotional and sensitive traits; are strong in the arts; often use imagination to solve problems; excel in idea generation; have broad cultural interests; are good at gathering information; work well in groups, manifest people-centric and open-minded approach.
2. *Assimilating (watching and thinking* - AC/RO) - learners approach issues with logic and precision; prefer to work with ideas and abstract concepts rather than people - they deem the former more important; they often require very clear explanations before undertaking a task; work better with theories than practical approaches; construct analytical models to explore phenomena; are good at analysis; they typically require more time to consider issues; are strong in information and science careers; show preference for lectures and readings.
3. *Converging (doing and thinking* - AC/AE) - learners definitely prefer technical tasks; are good at problem solving; are willing to test and experiment; have strong technological abilities; are practical and good at applying theories in practice and realising ideas and models; they are not people-centric.
4. *Accommodating (doing and feeling* - CE/AE) - learners demonstrate a strong hands-on practical approach; are driven by instinct rather than careful consideration or logical analysis; are good at achieving targets on time; enjoy challenges; are inclined to use other people's information and analysis; demonstrate good team-work skills; enjoy action and often take initiative [8][9].

Literature Review

A review of the literature has provided insights into approximately 250 available methods that can stimulate creativity. To map the current situation, a survey of techniques used to support creativity among teachers and students in the Faculty of Architecture and Design at Slovak University of Technology in Bratislava (FAD-STU), Bratislava, Slovakia, was carried out in 2020. Thirty-six teachers and 129 students participated in the survey, which is a relatively representative sample (approximately 36% of all teachers and 15% of all students). The survey included three basic questions:

1. Which methods (tools) supporting creativity do you know and apply in your teaching/studio design study?
2. What other methods to support creativity do you know?
3. In your opinion, for which aspects of architectural design are the methods that encourage creativity especially useful?

To simplify the situation, the survey questions were about the methods that support creative thinking, which most often appeared in the relevant literature. Respondents also had the opportunity to mention other methods that they use or at least know about. The survey was designed to test the knowledge and use of the following methods:

Mind Mapping

Mental maps or tree diagrams although most firmly ground in behavioural geography, are used also in psychology and other disciplines. In architectural design, they refer to a structured idea generation starting with an initial concept [8]. This method relies on memory, emotions and feelings when shaping urban space. Ideas are represented visually to aid the *free association* process of brainstorming. Also, the structuring of ideas is important as is their classification and positioning. The mental map will grow rapidly as new ideas are added to it and explored. As with brainstorming, also image analogies may be included as part of this method. Architects often employ this method when drawing, especially first drafts [10][11].

In architectural schools, mental maps can be employed at all levels of design education. As with professional work, their main advantage consists in generating design options, problem structuring, and of course, the graphical representation of ideas. However, quite rightly Kowaltowski et al indicate that …*the dangers also lie in this graphical transposition, where immature students can read solutions directly in diagrams and schematic decomposition of problems* [11]. Nevertheless, this method is used widely and praised as it improves the understanding of problems [11].

Brainstorming

Brainstorming is probably the best-known, and the most-widely applied, method to stimulate creativity. One of the key points in brainstorming is the gathering of experts from various fields, who will contribute their unique ideas without judgment or criticism by others. When brainstorming, it is crucial to focus on quantity and generate as many ideas as possible; be noncritical of the ideas that others generate and mindful not to suppress the free flow of ideas; welcome unusual ideas as they can combine and improve other ideas [11]. Osborn's definition of brainstorming as …*a conference technique by which a group of people attempts to find a solution for a specific problem by amassing ideas spontaneously* [11][12]. One of the main advantages of brainstorming in design instruction is its immediacy and the ensuing enthusiasm as they allow for …*quick and multiple generation of design solutions at the beginning of a course* [11].

Another benefit of using this method includes its potential to stimulate discussions and reflections on proposed solutions. Further, it may help avoiding stagnation in the design process, due to generating unique solutions. So, it can also be argued that this method stimulates productivity in the design process, as the repertoire of widely-ranging ideas rapidly increases in a relatively short period of time. However, the relation between the quantity and quality of ideas generated is an important issue to consider, and it has to be managed and balanced. Nonetheless, brainstorming is an effective method, especially …*when the largest number of ideas is brought forward* [11]. In architecture, the quantity of ideas is essential in student work, as more ideas in relation to the design problem result in better solutions that can be developed further [11][13]. Another positive aspect of brainstorming is its ability to improve student teamwork.

Analogy and Attribute

In architectural design, analogy is often considered as part of synectics - a wider teaching methodology that relies on creating connections between often seemingly unrelated objects [14]; hence, pushing one's imagination into previously uncharted territory of new ideas. Analogy is closely akin to metaphor, and can be personal, direct or presented as a compressed conflict [14]. All types of analogy increase mental flexibility in design and are considered appropriate across various levels of design architectural education.

As an educational tool, analogy is supposed to evoke more emotional rather than intellectual responses. Thus, it is often seen as irrational, absurd, seemingly irrelevant, yet it is a very powerful tool in stimulating students' creativity, and can be particularly useful in design methodology courses and sustainable design. In the suite of methods and tool stimulating creativity and fostering creative problem-solving, analogy can play a vital role in increasing students' design repertoire and enhance their creative process.

It has been argued that …*conceptual abstractions, coming from references, create bridges between mental and physical activities and are the basis for deeper exploration of theoretical concepts of design repertoire* [11][15], and …*formal repertoire is also known to be the most often applied information in the design-studio* [11][16]. Thus, when students are given a specific reference, they start amassing concepts related to that reference, thereby building their theoretical knowledge of design which can lead to generating new solutions [11]. However, as with other creativity-stimulating tools, there are challenges that students face when working with analogies. For example, some students may not have the analytical skills required for working with analogies [11][17], and their examples of analogy may be ineffective, shallow or plainly inappropriate for the reference. However, this tends to improve with time and increased experience as students will learn to see the problem of design from different angles, conceptually and as abstractions.

Biomimicry

Biomimicry is often seen in the realm of analogies; however, it is much more complex, and in order to be used properly, it requires a deeper …*understanding of the natural phenomenon behind a specific biological structure or example* [11]. In architectural design, its use often blends with searching for ideas across various disciplines, such as biology [18]. In architectural education, it is particularly beneficial for students in initial design classes, where the application of biomimicry helps them to understand better design problems when linked to natural phenomena and evolutionary systems. However, as the survey results indicate, this method can be challenging for some students, as well as their teachers, because they tend to rely only on visual associations unsupported by functional systematic study. There are other problems with biomimicry that relate to the tendency to evoke organic forms in the design, which may limit students' freedom to choose the design [11]. Nonetheless, the use of biomimicry can yield positive results for students with good drawing skills, as they can use it to communicate their ideas with clarity and detail.

Other Methods in the Survey

When responding to the survey, participants could also choose from the following methods*:* SWOT, morphological charts, removing mental blocks, form-deform-reform and rapid sketching.

Survey Results

The results of the survey (Figure 2 and Figure 3) can be interpreted as follows:

The most widely used methods to support creativity are reference buildings, associations and analogies (up to 97.2% of the students and 72.1% of the teachers). These tools are immediately followed by brainstorming (83.3% of the students and 69.8% of the teachers). While SWOT analysis is known and used by up to 75% of the surveyed students, less than half of the teacher respondents use it (approximately at the same level as the mind mapping method).

The question about the knowledge of other methods supporting creativity has revealed more significant differences between the survey respondents. The students actually did not mention any other than the ones directly pointed to in the survey, which may indicate their primary preference for those methods in the educational process.

The question: *in your opinion, for which aspects of architectural design are the methods that encourage creativity especially useful* has provided relatively surprising results.

In their response to this question, both teachers and students were most inclined to the spatial aspects of the design (84.5% of the students and 91.7% of the teachers). Presumed formal and aesthetic aspects appeared in teachers' answers in the 2nd place (65.9%) and in students' even lower in the 3rd place, but with a high preference (77%). As expected, respondents gave the least importance to methods supporting creativity in regard to environmental and ecological aspects, where they clearly prefer scientific and empirical methods and procedures.

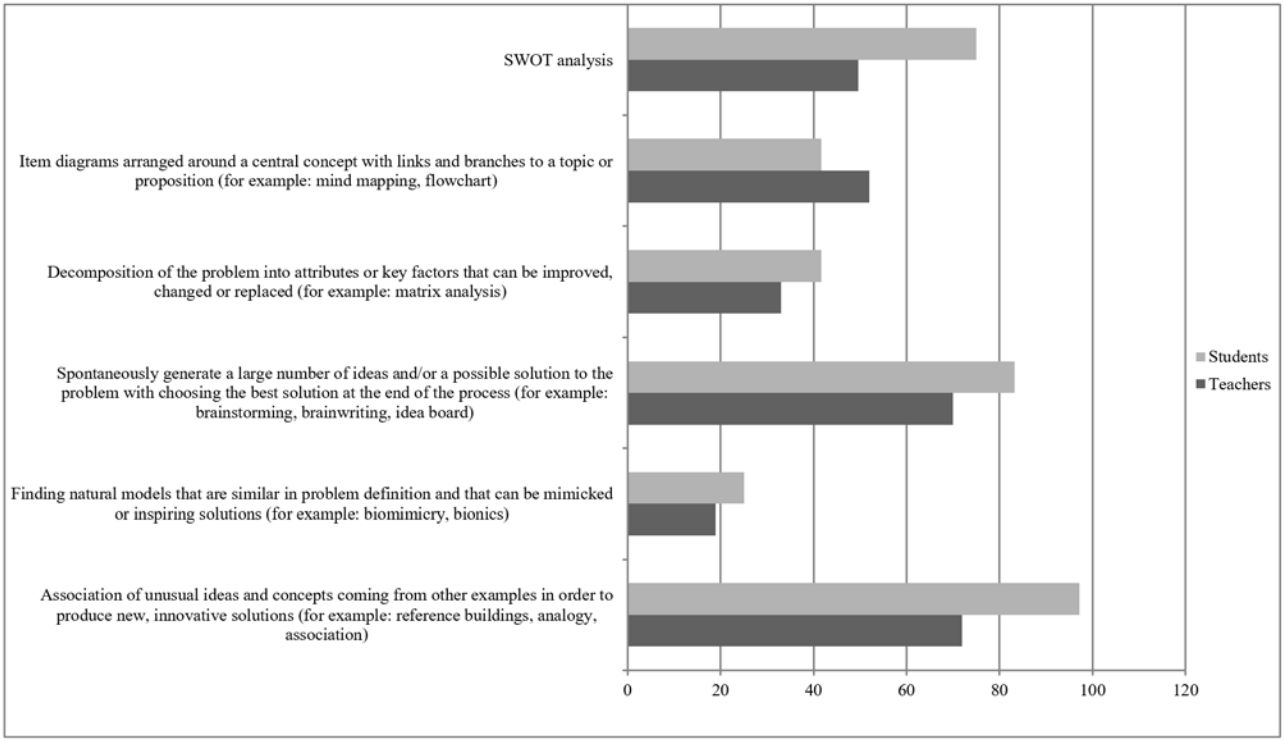

Figure 2: Comparison of using methods supporting creativity by FAD-STU teachers and students in percentages.

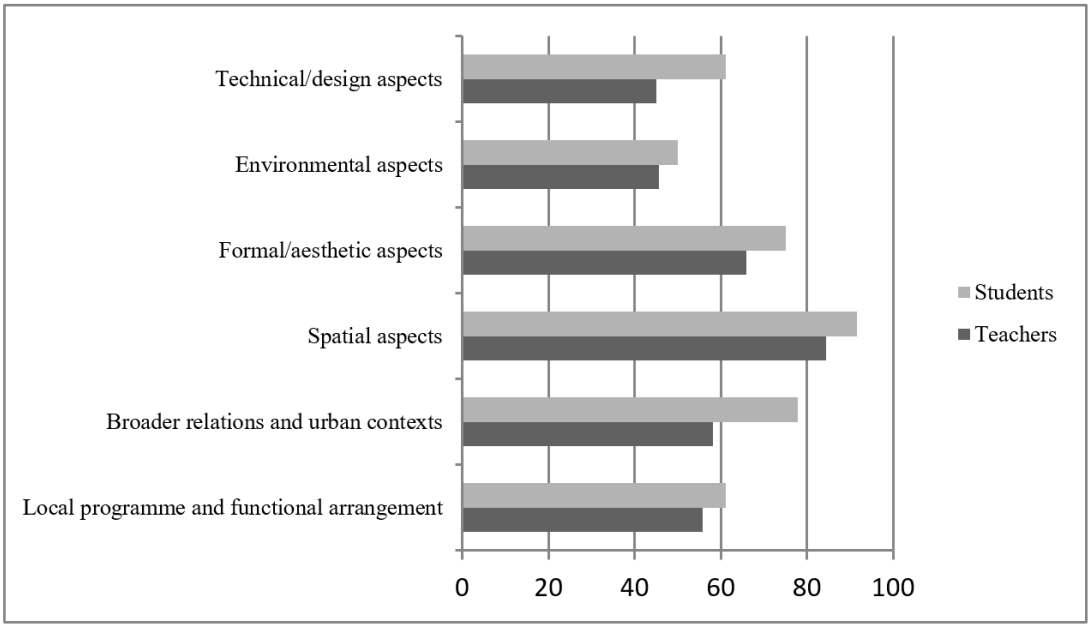

Figure 3: Comparison of student and teacher responses to the question: *in your opinion, for which aspects of architectural design, are the methods that encourage creativity, especially useful* - in percentages.

The above results relate exclusively to the Faculty of Architecture and Design at Slovak University of Technology in Bratislava, Slovakia, as the 1st stage of the research focused only on this Faculty. In the next stages, the research will be carried out at other universities to enable results comparison.

CONCLUSIONS

Architectural design is an artistic activity with the application of scientific and technological knowledge. In architecture, it is also a matter of searching for the best form that enables various human activities and addresses different user needs. Due to the complexity of the design process, there are no precise and solid formulas that combine form, function,

context conditions and available technologies. Methods for increasing creativity play, therefore, an important role, especially in the process of educating future architects, when they only begin to learn how to approach the process of creation and design.

The creative person does not try to use old solutions to problems, but will look for new methods and new, more effective ways in problem solving by combining ideas that previously seemed unrelated. The creative person is not discouraged by challenges or momentary disappointments, but connects disparate ideas, is not afraid to use unorthodox methods, uses analytical methods and interrelationships between information to solve problems, and boldly follows new methods and solutions that others deem outside of their area of interest,

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BIOGRAPHY

Pavel Gregor graduated Master of Architecture from Slovak University of Technology (Bratislava, Slovakia), and Doctor of Philosophy from Slovak University of Technology (Bratislava), in 1981 and 1986, respectively. Professor Gregor is currently Dean of the Faculty of Architecture and Design at Slovak University of Technology in Bratislava (FAD-STU). Pavel Gregor is the author and co-author of more than 70 realised architectural works, many of them with the highest awards, and numerous publications. His pedagogical and professional activities are focused on the issue of protection and restoration of architectural heritage, including new architectural creation in the historical environment. He developed a concept, for specialised teaching of the issue of restoration of architectural heritage and more recently led a transformation of the design studio teaching at the FAD-STU, Bratislava, Slovakia.