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## HOW PLAYING AND HAVING FUN WITH GEOMETRY OF SPATIAL OBJECTS CAN BE INSPIRATIONAL IN CREATIVE ARCHITECTURE DESIGN

### ZABAWA GEOMETRIĄ BRYŁ INSPIRACJĄ W TWÓRCZYM PROJEKTOWANIU ARCHITEKTONICZNYM

#### A b s t r a c t

Playing with transformations of a simple cube or plain sheet of paper using generative forming and folding is an exercise performed by first-year students at the Faculty of Architecture of the Silesian University of Technology in classes on single-family house design. The purpose of this architectural exercise is the search for inspiration and to stimulate students' creative thinking. It is a kind of initiation for young people who from the school bench in high school go to study architecture. Young people surprise themselves with their inventiveness and creative maturity while maintaining a fresh outlook. How to use this potential? What tools can be used in teaching so that they can effectively assimilate new ways of working and master new tools? How can we help the adepts of the profession to find the moment of transition to a higher level of creative initiation and how can we motivate them towards further research? The first year of study at the Faculty of Architecture is a very important experience for young people and a responsible task for teachers.

*Keywords:* generative forming, folding method, the creator, creativity, stimulation of creativity, search for inspiration, students' work, single-family houses

#### S t r e s z c z e n i e

Zabawa w przekształcanie prostej kostki sześciennej czy płaszczyzny kartki papieru metodą generatywnego formowania i metoda faldowania – takie ćwiczenia wykonują studenci pierwszego roku Wydziału Architektury Politechniki Śląskiej w ramach zajęć z Projektowania domów jednorodzinnych. Celem tej architektonicznej zabawy jest poszukiwanie inspiracji i pobudzenia ich kreatywnego myślenia. To rodzaj inicjacji dla młodych ludzi, którzy z ławki uczniowskiej w szkole średniej przechodzą na studia architektoniczne. Młodzi ludzie zaskakują swoją inwencją i twórczą dojrzałością, a jednocześnie świeżym spojrzeniem. W jaki sposób wykorzystać ten potencjał? Jakich narzędzi używać w pracy dydaktycznej, by mogli oni skutecznie przyswoić sobie nowe metody pracy i opanować nowe narzędzia? Jak pomóc adeptom zawodu, by moment przejścia na wyższy poziom wtajeniowania był twórczy i motywował do dalszych poszukiwań? Pierwszy rok studiów na Wydziale Architektury jest dla młodych ludzi bardzo ważnym doświadczeniem, a dla nauczycieli akademickich odpowiedzialnym zadaniem.

*Słowa kluczowe:* metoda generatywnego formowania, Metoda faldowania, twórca, twórczość, pobudzanie kreatywności, poszukiwanie inspiracji, prace studenckie, domy jednorodzinne

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## **1. Introduction**

There are different sources of inspiration in the search for creative architectural design. They may be the context of the place, buildings created in different historical periods, in different styles, the works of other contemporary architects, innovative design solutions, but can also be art, which consists of images, music, or biological processes, products of the world of living and inanimate nature, models, graphs and mathematical modules, and rules and principles of geometry. It may also be playing with plain and simple geometric objects, their composition, the search for relationships in space, or their transformation, deformation, or multiplication. The search for analogies in technical fields, natural sciences, social (and therefore beyond architecture as such) offers the highest level of creative discovery. As Gasparski says: "Designing is creating new totals (new systems) from known parts (known subsystems or components)" [6].

## **2. Searching for inspiration**

Didactic exercises (experiments) in teaching architectural design introduced at the Faculty of Architecture, Silesian University of Technology in the classes of Single-family House Design, in order to seek inspiration and stimulate their creative thinking.

### **Generative moulding method**

The method of generative forming is an example of the practical application of theoretical reflections on the universality of the language of space. One useful and inspiring directory is the set of activities named in words and depicted graphically, based on the geometry of spatial form presented in the *Operative Design – A catalogue of Spatial Verbs* [4] by Anthony Di Mari and Nora Yoo (young architects and teachers of architecture). It is a tool that helps to consciously control the unlimited possibilities of architectural moulding. Each step can be named and thereby consciously used. The catalogue is open to authorial supplementation by each architect, giving opportunities to build an infinite number of multilevel manipulation operations on form and space. It shows the components of the formation process, which is initiated by a basic action, then developed – according to merging principles – into a complex system of 3D formal transformations. [18]

### **Folding method**

This design process was introduced by Sophia Vyzoviti, using her didactic experience in teaching architectural design at the Faculty of Architecture at the Technical University of Delft in the book *Folding Architecture: Spatial, Structural and Organisational Diagrams* [20]. The principle of the method is to convert the plane of the paper (the paper) into a spatial form while maintaining the condition of continuity in the material used. Any activity intuitively leading to an acceptable spatial form can be used. A set of verbs defining these activities creates an open list of activities called generative, i.e. causing the projected space and form. This is done morphogenetically, in which the final form is obtained as a result of a sequence of transformations. [18]

Table 1.

Open catalogues of activities in the method of forming and folding method – juxtaposition of terms. [18]

Catalogue of generative core activities on spatial forms by Anthony Di Mari & Nora Yoo:	Catalogue of generative operations used in the strategy by Sophia Vyzovity folding:
SPATIAL FORMAL OPERATION:	GENERIC ACTIONS:
1. Extrude 2. Inflate 3. Branch 4. Merge 5. Nest 6. Offset 7. Bend 8. Skew 9. Split 10. Twist 11. Interlock 12. Intersect 13. Lift 14. Lodge 15. Expand	16. Overlap 17. Rotate 18. Shift 19. Carve 20. Compress 21. Fracture 22. Grade 23. Notch 24. Pinch 25. Shear 26. Taper 27. Embed 28. Extract 29. Inscribe 30. Puncture
METHODS of AGGREGATIONS:	
31. REFLECT 32. PACK 33. STACK 34. ARRAY 35. JOIN	1. Fold 2. Press 3. Crease 4. Pleat 5. Score 6. Cut 7. Pull Up 8. Rotate 9. Twist 10. Revolve 11. Wrap 12. Pierce 13. Hinge 14. Knot 15. Weave 16. Compress 17. Unfold

### Exercise:

The task for the students was the following:

- in the first place, transform a simple geometric block (cube or rectangular made of foam, styrofoam or plasticine), into a living space for people, performing 3–5 operations on the object;
- in the second place, convert an ordinary sheet of paper, cardboard or piece of plexiglas into a 3D object using 3–5 operations while maintaining the continuity of the object.

The paper or foam model is normally deprived of scale. By adopting the scale of the object its space can be analysed for adaptation to necessary features. The operation manually performed on a piece of paper or on a styrofoam block can successfully be replaced by 3D operations performed on the computer.

The purpose of this architectural game was to find inspiration for the project and stimulate creative thinking. It's a kind of initiation for young people who go to study architecture after secondary school. This is the beginning of their road to becoming creative artists. [18]

### 3. Creativity, creator and creative thinking

According to Tatarkiewicz [13] the word ‘**creativity**’ has a double meaning. The first is the process in the mind of person creating (creator), the second refers to the product of this process (works). The features that distinguish between creative and non-creative works are: **novelty** and **mental energy**. The feature of **novelty** entails bearing a quality which was not there before. **Mental energy** as the second measure of creativity is the hallmark of works that particularly show the ability of creator, their talent, genius, their creative tension, and the specific energy they used to produce this work.

According to E. Nęcki, [9] in addition to **novelty**, there is a second requirement, which is the **value**.

The subject of creative activity is the person we call the **Creator**, if he/she has the capacity to produce creations that are characterised by the simultaneous presence of two features: novelty and value. It is worth quoting A. Troskolański [14] on the traits attributed to the creative man that have functioned in psychology for many years: ‘In Arthur Koestler’s famous work *The Act of Creation*. [8] containing *The theory of the creative process*, there is the notion of the *gift of creativity*, as an *individual property* of individual who, thanks to an *innate disposition*, *unique perceptivity, intuition, and fluency of thoughts*, is able to pluck *the grains of truth*, from the tortuous reality of the world. These features constitute *the creative activity of man*’ [18].

The creative feature of the individual is assumed to be called **creativity**.

The creativity of the individual (developers) is subject to analysis. J. p. Guilford [7] introduced tests that enabled the features of the creative attitude to be examined, such as:

- liquidity – this feature defines the ease of coming up with ideas.
- flexibility – is the willingness to change the direction of thinking.
- originality – is the ability to create atypical, unique, unusual behaviours [18].

In any profession the passive, imitative attitude characteristic of the poor craftsman can be present. The good craftsman is an artist. We should be interested in the creative attitude, seeking new challenges, discussing with the existing reality, to change it and improve it. This requires a proper inner attitude and, despite appearances, is not obvious even for “professional” architects. (...) Prerequisites to creative activities are: **the search for innovation** and **recognition of the value** in what you are doing” [Zubel 16 p. 25].

### 4. Learning of creative thinking

Fortunately, creative thinking skills can be learned. Ways to encourage creativity are numerous and in fact different approaches are required for different people.

We train our mind to search for original solutions. We develop in our thinking a broader openness to creating ideas that would be contrary to the laws of logic and adopted rules. We stimulate the imagination to create unusual and improbable things by playing with the creative imagination.

It is difficult to find new solutions and create interesting, original ideas if we continually repeat our behaviours and duplicate the same strategies. As Abraham Maslow said, “If the

only tool they use is a hammer, everything will be treated as nails". Habit is the biggest barrier to creative thinking. [Maryńczuk 11 p. 14–16]

Human creativity is a feature of human nature, but we have only recently begun to understand its essence. Thanks to it we are able to look at the problem from a different perspective, apply innovative solutions and create scenarios for complex actions. Creativity is not a skill with which we are born. You can develop it by 3 steps:

- first we have to recognize the restrictions that we impose upon ourselves;
- secondly, we must reject or eliminate this assumption as too limiting;
- thirdly, we must consider the consequences of such a rejection.

Participation in the development of a project is great fun. Getting rid of the constraints, which leads to the free play of the imagination, is a liberating and exciting experience. Dealing with it can be compared to playing a role of the almighty in a limited world, receiving creative experience, which is necessary for each artist. [Maryńczuk 16 p. 9–11]

## 5. Stimulating creativity through play

Mary Lou Cook used to say: "Creativity is inventing, experimenting, growing, taking risks, breaking rules, making mistakes and having fun." Fun aids creative thinking. It allows you to break through emotional obstacles, actuates activity, activates the energy potential, and provides strong creative motivation [Maryńczuk 11 p. 17].

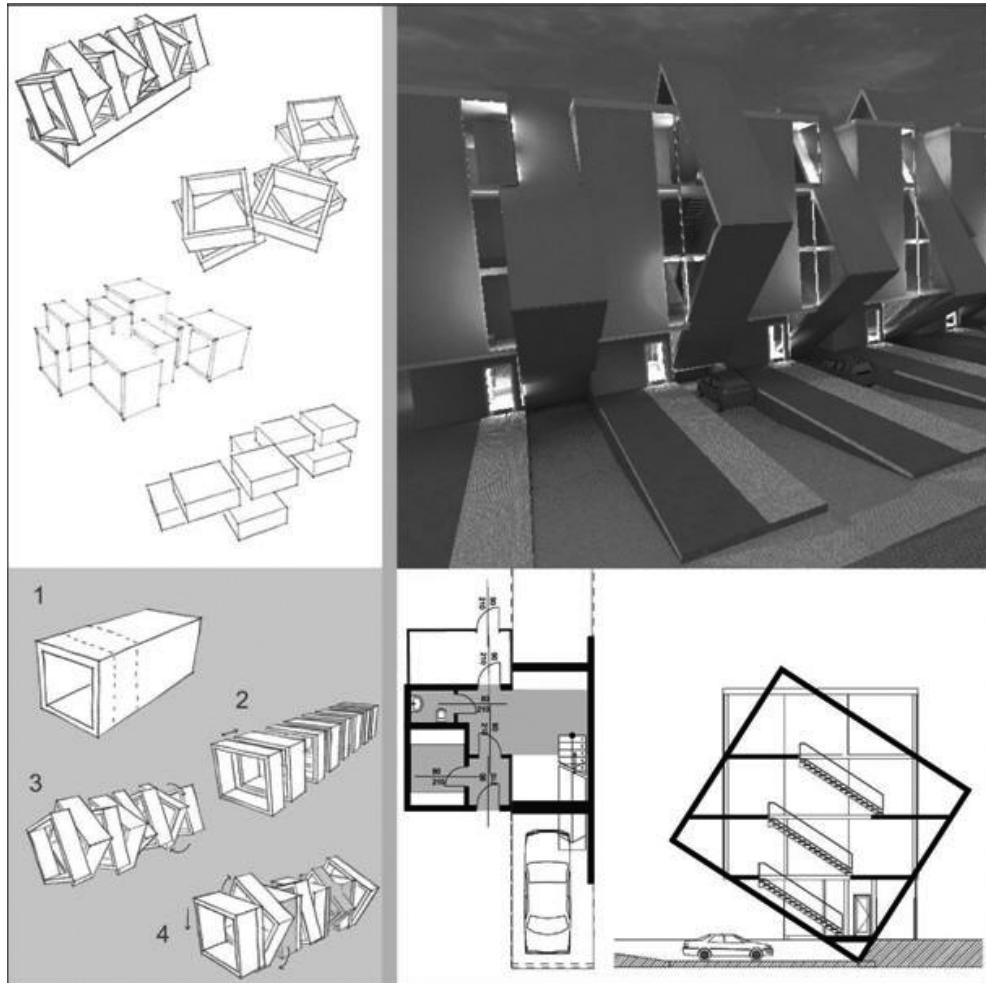
What kind of criteria must be met in order to call an action playful/fun? According to Groos, Buytendijk, Claparède play/fun is a cognitive exercise which is characterized by fictitiousness, playing with space, creativity, tendency to repetition, pleasure, relaxation, freedom, and youthful dynamics [6]. A design exercise can meet most of these criteria.

Following the definition in the PWN Encyclopaedia, playing/having fun is: creating a fictional, desired "pretended" world in order to understand it better. The basic features of playing include: the ability to choose, spontaneity, metamorphosis, creativity, impracticality, voluntarism and altruism, remaining in opposition to seriousness and work [Balcer-Zgraja 17 p. 64].

Without going deeper into the issues related to the psychology of creativity, we can see, based on everyday experiences, a simple relationship between the enjoyment of work and the final result of study research. "Where there is no play there is depression" [2] crippling inhibitions and fears. In contrast, a satisfactory effect appears wherever the author draws pleasure from their work.

Playing/having fun with form is a series of experiments carried out in a systematic way, and goes beyond hackneyed thinking and is rewarding. J. Kollartis attempts to clearly identify what fun is in the process called *jeux scientifiques*, scientific fun. [2]

Wherever research and creative explorations might be pursued – in design, art, education, science and management, play experienced again by adults can become a source of success [2]. "It is much easier to take risks in play than work. So why not treat these first attempts to build architectural form as fun?" [Serdyńska 16 p. 92]. Many serious contemporary entrepreneurs bring accents associated purely with fun into their workplaces, they also participate in studies on the effect of fun on the increase in employees' creativity [3]. Observations and



III. 1. An example of poster project implemented within the framework of exercise of Design of houses the Faculty of Architecture University of Technology in Gliwice, Stud.: Marta Rajczykowska, leader: Ph.D. Arch. Anna Kossak-Jagodzińska

studies show that deriving pleasure from their work, jokes, distance, and the attempt to free themselves from the shackles of stereotyped thinking programmed in the educational process usually lead to very good results [Balcer-Zgraja 17 p. 68].

## 6. Inspiration to design

The single-family home project carried out in the 2nd semester of studies is the first strictly architectural task that the student meets in the course of education. For the first

time in his/her life s/he must confront the problem of designing a space for a required function. The fact that the knowledge of what a single-family home looks like is widespread, despite appearances, only complicates and hinders the matter, because on first impulse the student tries to copy, more or less consciously, solutions s/he already knows. The role of the teacher is to make the student realise that designing is a creative activity, requiring the beaten track to be abandoned, and questioning ready-made solutions. [Serdyńska 16 p. 91]

According to the Polish Language Dictionary PWN an inspiration is:

inspiration, creative enthusiasm, luck  
the impact on someone's suggestion

Translating this definition into academic realities, on the one hand we have a student looking for inspiration, on the other a teacher who should inspire him/her.

Peter Zumthor [19] defines architecture teaching as follows: "Young people come to the university, they want to be architects, they want to find out whether they have a knack for it. What shall be transmitted to them in the beginning? First you have to explain to them that the teacher standing in front of them is not one who asks questions and knows the answer in advance. To create architecture is to ask questions to yourself, is to get closer to your own answers, to revolve around them and to find them with the support of the teacher. Always and constantly."

In this specification, there is no place for absolute authority of the infallible teacher. The teacher of architecture is someone who provokes the student to ask questions and helps them to find answers. What is even more amazing, most likely there is no single, correct objective response – the answers are the student's own, so subjective, and the process of discovery is continuous. A good answer yesterday may not be a good one today. The essence of learning is the constant search [Serdyńska 16 p. 91]

## 7. Summary

The ability to design is one of the areas in which knowledge is derived from experience. According to Confucius: "Tell me and I will forget, show me and I may remember, involve me and I will understand". In the twentieth century this became an inspiration for experimental learning theorists. Experiential learning is the process of making meaning from direct experience. Aristotle once said: "For the things we have to learn before we can do them, we learn by doing them" [Balcer- Zgraja 16 p. 78].

"In architectural education, teaching approaches are more important than just teaching the profession. Fixing the whole range of knowledge and experience is extremely important from the beginning, only then can the student grasp the sense of the whole aspect. Such an approach in teaching would prompt the designer to creative effort, which would aim to simultaneously fuse the design, construction and economics of the particular task with its social objectives" [Walter Gropius, VI CIAM Congress Bridgewater England 1947].

In Department of Architectural Design at the Faculty of Architecture, Technical University of Silesia we have been conducting research on how to teach students creative thinking for several years, which has resulted in a series of publications "*Initiations in Architecture*" [1, 11, 15, 16, 17].

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