

Teaching drawing to a new generation of engineers architects

Maria J. Żychowska

Cracow University of Technology
Kraków, Poland

ABSTRACT: Looking at the architects who treat drawing as a fundamental means of expressing their intentions, it can be concluded that communicating through freehand drawing is an efficient way of working and conveying impressions. Architects have drawn since time immemorial and continue to do so nowadays. The author provides her own experiences in the field of teaching freehand drawing for students at Cracow University of Technology (CUT), Kraków, Poland. The methods and programme of teaching are based on the school's artistic achievements and local tradition, but is also strongly affected by contemporary trends, architectural concepts and the technical media. The process of drawing in architecture teaches students about architecture as a profession in which drawing serves the purpose of information and becomes a tool for conveying messages.

INTRODUCTION

The process of drawing in architecture: its representation, explanation and appreciation, has several stages. The first concerns the specificity of the drawing, which involves, among other things, the issues of perspective and structure that need to be learnt. In architecture as a profession drawings serve informative purposes and need to be perfected in terms of both content and graphics. After graduation, the architect as a mature professional deals with the shaping of space and the human environment, from concept creation to participation in the implementation of designed forms. The architect often uses drawings to convey a message, especially when speed and efficiency are priorities. Skilful drawing is expected at all stages of construction; namely, in the first phase of creating a graphic concept; in the second phase of designing the form and function of the object and its spatial relations with the environment; the third phase is the object's implementation; and finally, in the fourth phase, when the object's aesthetic reception by the viewer or the user occurs. It is also worth adding that when an architect likes drawing and is good at it, the very act of creation gives pleasure.

FASHION FOR ARCHITECTURAL DRAWINGS

When computers were first introduced, with imaging capabilities, excellent drawing and graphic tools, many architects considered the teaching of freehand drawing a relic of the past. As a result, this subject was taught only for a minimum number of hours in very few schools across the world. However, despite such opinions and tendencies to depreciate the manual skills of future architects, it is worth noting a revival of drawing. The best example is the creation of the Museum of Architectural Drawing (Museum für Architekturzeichnung) in Berlin. In June 2013, a notable building was constructed for the Sergey Tchoban Foundation on the site of the former Pfefferberg brewery at 18a Christinenstraße in Berlin. The founder, an excellent draftsman, donated a part of his collection to the museum. The collection includes drawings by renowned architects from the 16th to the 21st Century.

Since the creation of the Tchoban Foundation Museum of Architectural Drawing in Berlin, many interesting and outstanding exhibitions have been organised there. The statutory goal of the museum exhibition programme has been to present a wide range of architectural drawings, from historical plans to contemporary visions and architectural fantasies. The exhibitions included drawings by remarkable architects who used this medium to give new significance to the role of architecture in society. The museum is a unique centre for the presentation of drawings by the most renowned artists who consider drawing and painting as inherent elements of their profession and who have influenced younger generations. Some of them, like the English architect Sir Peter Cook or the late American architect and artist, Lebbeus Woods, can be regarded as architectural revolutionaries. The museum's activities arouse the interest of European architects. Successive exhibitions and scientific symposia have a large international audience and attract the most prominent artists who exhibit their works, as well as representatives of leading architectural colleges.



Figure 1: The Museum for Architectural Drawing (Museum für Architekturzeichnung) in Berlin.

FACULTY OF ARCHITECTURE IN KRAKÓW

The specificity of architectural education in Kraków has been marked since the mid-19th Century and regular courses began in the period between the two world wars. The originality of the educational approach was apparent from the start and is still evident [1]. It resulted from sensitivity to local cultural heritage, tradition and the cultivation of a specific approach to teaching. It also reflected the personality of the academic teachers who taught art and design courses. The atmosphere of respect for heritage, awareness of the Faculty's uniqueness and the conviction about the superiority of freehand drawing as a medium resulted in some visionary projects. Their value consisted mainly in the quality of execution, which made them look like paintings rather than architectural projects.

Designing for the future, foreseeing needs, anticipating social demand has been valued since time immemorial. Leonardo da Vinci was such a visionary, tirelessly drawing futuristic projects. Many of his architectural sketches have survived. It was by pure chance that one of Leonardo da Vinci's projects, whose sketches had been preserved, was realised. In 1502, da Vinci made simple drawings of a 240 m single span bridge over the Golden Horn at the mouth of the natural strait, Bosphorus, in Constantinople, which he designed for Sultan Bajazet II (Bayezid II). The bridge resembled a flattened arch. Da Vinci envisaged a narrowing in the middle and wide ends anchored in the banks. The bridge was 24 m wide, 360 m long and 40 m high at the topmost point of the span [2].

The 300-year-old engineering solution proved feasible in modern times and a bridge following the design was built in Norway in 2001. This is a remarkable result combining Renaissance versatility and ingenuity with contemporary technology and, above all, it is an affirmation of the ingenious engineering ideas of Leonardo da Vinci.

One observation is of the value of drawing as a timeless medium of communication between inventors, constructors and architects. Such a notation of ideas, despite the apparent impermanence of paper remains clear and understandable, and is a universal document of the synthetic hand-drawn lines which are legible through the epochs.

INSPIRATIONS

Architecture as an art has a wide influence on the surrounding space and the human environment. Therefore, drawing courses should teach students responsibility for the environment, awareness of its complexity and diversity, as well as set high standards for its development. Teaching methods should foster creativity. Emphasis should be placed on invention and skill, intellectual and manual abilities.

The drawing tasks should not focus solely on reproduction. It is indispensable to create situations where drawing becomes a means of conceptual work. Teaching drawing as a specific medium also involves creating the habit of use. The aim is to master the skill, so as to make drawing a way of expression for the prospective architect. This type of teaching continues, to a large extent, in architectural education at Cracow University of Technology. Despite many constraints in terms of the length and content of the course, the teaching of artistic disciplines in the Faculty of Architecture at Cracow University of Technology (FA-CUT) is still important and is carried out with passion. It is the characteristics and distinctive features of the Faculty, which often determine the choice of this University by students of the European initiatives, ERASMUS and SOCRATES (Lifelong Learning Programme 2007-2013).



Figure 2: Drawing workshop, Faculty of Architecture, CUT.

Since drawing architecture, its representation, explanation and appreciation, involves knowledge of perspective and construction, prospective students should be familiar with these before they take the entrance examination to study at architectural faculties in Poland. Subsequent courses train students in drawing skills with a focus on the architect's professional needs as regards imaging, searching for forms, inventiveness and creativity. Classes are designed so as to stimulate students' imagination and the ability to look for, and make use of, inspirations in the set space, i.e. the ability to recognise the characteristic features of a site which make it unique. They become the guidelines and basis for designing the form in an architectural, urban and cultural context.

Noticing the uniqueness of the environment and its characteristics allow the architect in the process of designing to look for shapes and forms which reflect reality, and not just the architect's ideas. Classes focusing on these issues begin in the drawing course in the third semester. Students are supposed to register the designated space and draw the dimensions of urban interiors, such as a square, a street, a green area - taking account of the architectural context and its characteristics. The fundamental task is to note the scale of the urban interior and its elements, such as the existing buildings and greenery viewed from the natural horizon. The students are also expected to convey the mood of the site and its park-like character.

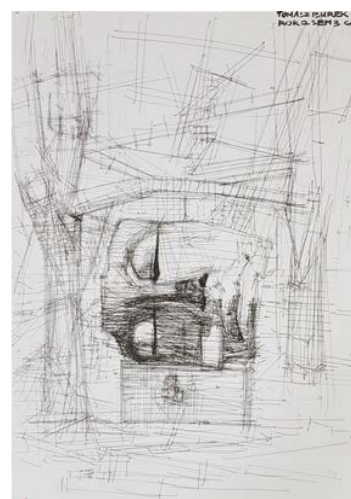
Another task concerns an outdoor exhibition of sculptures by Polish artist Igor Mitoraj. The point is to make the students notice spatial determinants and include them in their own exhibition, which should be the beginning of an in-depth analysis that ought to precede further designing activities in the designated space and site.



3)



4)



5)

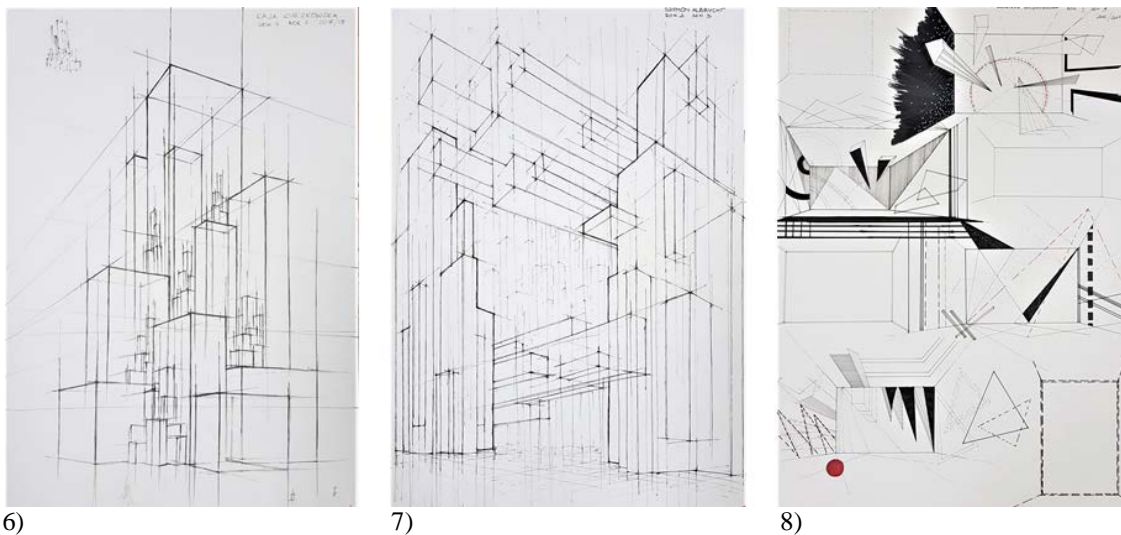
Figures 3, 4 and 5: Park Młynówka Królewska; sketches in the field; and with sculptures by Igor Mitoraj.

A significant element of the courses is the reference to the history of art, and precisely to the beginnings of modern trends in painting, as well as to the beginnings of modern architecture. Based on the elements of the art of Kazimir Malevich and the principles of Suprematism, there is a presentation of paintings, including *architectons*, i.e. spatial sculpture forms, which were to serve as models for the architecture of the future [3]. Malevich was the first to use the experience of abstract paintings in architecture. This form of art, crucial for modern times, became the new academicism, conquering Europe and the modern world. It was accepted in architecture and decorative art.

More than 100 years on, the principles of shaping the buildings, their tectonics and structure proposed at the time still remain valid. Students have to complete during their drawing course a graphic interpretation of Kazimir Malevich's *architectons*. The exercise starts with a study of the synthetic spatial forms, which were models for modern architecture at the beginning of the 20th Century. Students are supposed to use them as a source of inspiration and a point of departure in their own compositions. The aim is to make students discern the artist's original intention and to develop the theme in a creative way. Interpretation of spatial forms should stimulate students' imagination and let them use various motives and trends freely in order to create new spatial forms.

Yet another task related to this thematic and historical period consists in creating the stage design for the opera, *Victory over the Sun*. The original costumes and scenography designed by K. Malevich are held in the collection of the State Museum in St. Petersburg, but the musical score by Mikhail Matyushin, the libretto by poet Aleksei Kruchenykh and the prologue by Velimir Khlebnikov have been lost. The opera was staged twice: in January and December 1913. Since then, efforts have been made repeatedly to perform it despite the missing documentation. The most recent spectacle based on some elements of the opera's choreography was shown during the opening ceremony of the 17th World Cup in Seoul and watched by half a billion viewers. That is why the topic has been included in the teaching programme.

The aim of the exercise is to draw stage designs for the designated stage space using elements of costumes and fragments of the animated version of the opera. An important issue is the choice of the appropriate horizon and arrangement of the stage interior, so that it would correspond to the opera content and create conditions for acting. Specific functional determiners and additional artistic effects, such as lighting, have to be taken into account.



Figures 6, 7 and 8: *Architectons* and sketches of the stage design for the opera, *Victory over the Sun*.

Most of the historical achievements of architecture, together with its diversity, richness of detail and formal complexity, only now can be fully defined and described owing to fractal geometry, a new tool. A significant part of architecture can be said to have fractal features. When the theory of chaos, the science of complexity and its graphic unit, i.e. the fractal, was described mathematically in the mid-1970s, our view of the world around us, and space, changed. This revolutionary concept of perceiving reality made its way into the history of architecture. Although, after several years of fascination with fractals and deconstructivism architects generally ignore this field of knowledge, some innovative research has been going on in the field. It concerns both the interpretation of historical architecture and urban design. Some researchers associate fractal architecture with organic buildings designed in the spirit of the *new* religion: ecology.

The American architect Frank Gehry has become a pioneer in the search for extremely complex forms, creating some excellent architecture based on sinusoidal curves, such as the Bilbao and Seattle museums. A realised example of fractal architecture is the Federation Square in Melbourne, Australia. Authors Peter Davidson and Don Bates created an urban and architectural space in the spirit of new geometry, implementing a vision of urban space intended for functions related to culture, trade and for public utility. The central square is a key element of the whole complex. On the one hand, it organises the adjacent objects and, on the other hand, makes an impression by its vast and precisely composed surface. It is made of sandstone triangles varying in size and colour (from pink to purple and grey) and arranged according to the patterns of fractal geometry. The adjacent new buildings and historical objects have been included in the composition of the interior. The dominating aesthetics of the architecture are fractal elevations of building, such as the Yarra Building closing the southern façade and connecting the square to the riverfront. It is a multi-function complex with a spatially shaped façade whose only component element is again the triangle, whose size varies and which is multiplied and laid in various direction creating a geometric pattern. The main building materials include sheet metal, glass and sandstone. The same principle governs the structure of the façades of the remaining new buildings. Geometric proportions and the use of building materials vary from building to building. All the parts of the curtain wall

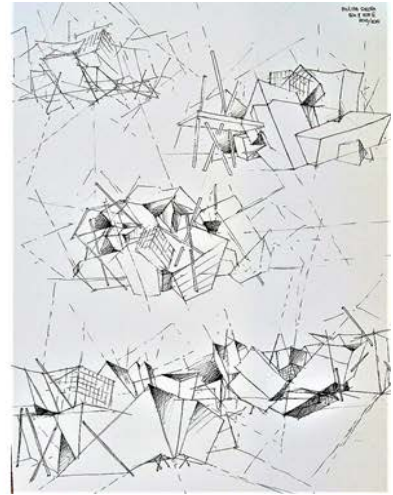
seem to be ever changing, dynamic and yet homogenous surfaces. It is worth pointing out that the object is a realisation of futuristic ideas and visions which, in other parts of the world, remain but a subject of timid discussions.



9)



10)



11)

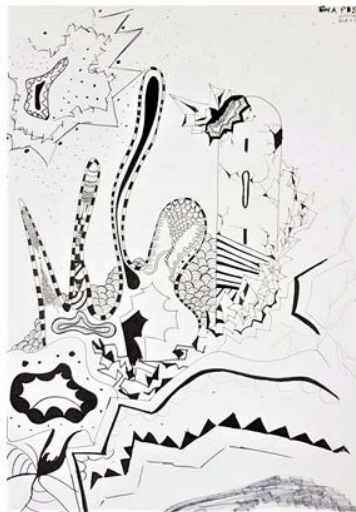
Figures 9, 10 and 11: Sketches of patterns of fractal geometry.

Combining pure mathematics and architecture is fascinating and, therefore, introducing the topic into the teaching programme seems to encourage students to take up in-depth studies and, above all, contributes to the creation of excellent work [4]. Students' interest in the subject, its originality and the possibility of using it in other projects, are vital to the success of the curriculum and teacher satisfaction.

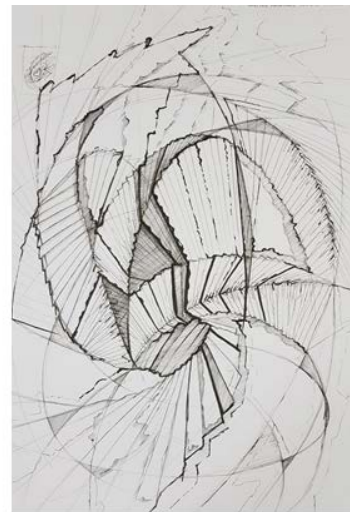
Another important element of teaching is reference to the works of the most outstanding architects and presentation of some of their works. Such examples may inspire students' creativity in their own projects. Undoubtedly, such a figure is Sir Peter Cook, a British architect who celebrated his eightieth birthday in 2017. His drawings: from Archigram to CRAB, from 1968 to 2016, from Plug-in City to Hidden City were exhibited in many places around the world. Some of them are based on real projects, such as the 1986 zoning plan for Frankfurt-Oberrad. However, the majority are experiments and utopias such as Hidden City, where architecture is inspired by the surrounding vegetation and the borderline between the two is obliterated thus making the architecture merge organically with nature. He opined *...drawing for me is the most natural way of thinking about architectural ideas ... The other thing about drawing is that it does not have to be absolutely correct and I sometimes get irritated by the ability of the digital technology to record everything and make it all precise. I think it remains the mandate of the creative artist to exaggerate and hide as well as depict* [5].



12)



13)



14)

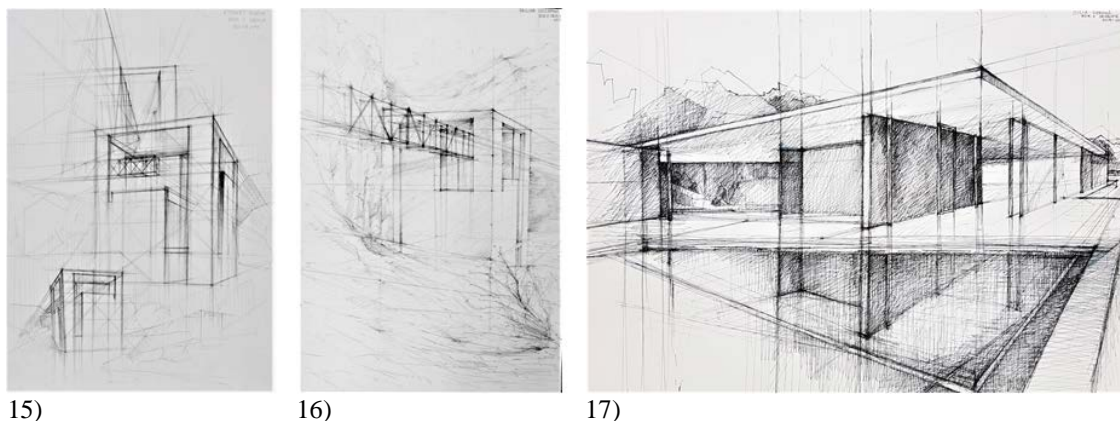
Figures 12, 13 and 14: A graphic concept of a poster for an exhibition of Peter Cook's works.

A student task is to create a graphic concept of a poster for an exhibition of Peter Cook's works. The poster has to present the subject of the exhibition in a legible way while highlighting the characteristic features of the architect's works, such as vividness, colour and dynamism.

Getting to know architects, their activities and works broadens general knowledge. It allows familiarisation with fashions, moods and current aesthetic trends. At the same time, creating paintings inspired by the achievements of

the most outstanding artists enhances experience and contributes to better memorisation of important structures, particularities and details. It is possible to make physical or virtual models of the most remarkable buildings, but it is also possible to make graphic notation and perspective views of their fragments. This resembles sketching views of particular buildings while sightseeing.

The practice has been almost completely discontinued as electronic tools for recording images are so perfect and easy to use that they have replaced sketchbooks. However, project presentations in the Faculty of Architecture at Cracow University of Technology still have to include hand-drawn images on display panels. That is why another task students must complete in their drawing classes is to make a sketch of two icons of modern architecture, and then present them in the form of a perspective drawing using any technique they want. One of the icons is Casa Bianchi by Mario Botta and the other is Barcelona Pavilion by Ludwig Mies van der Rohe [6]. A thorough study of the objects, their specific and expressive aesthetics forces students to develop graphic representations to reflect the structure, character and mood. Such in-depth interpretation and understanding of the artist's work gives students experience, raises their awareness and, most importantly, teaches them to notice the unique qualities which they can use in their own projects.



Figures 15, 16 and 17: Sketches of Casa Bianchi by Mario Botta and *Barcelona Pavilion* by Ludwig Mies van der Rohe.

It is also worth mentioning the city of Kraków with its unique beauty and the deeply rooted *genius loci*. The city's architecture has distinctive qualities and unusual artistic values. Teaching art subjects in such a place retains sensitivity to local cultural heritage and tradition. Therefore, part of the freehand drawing course involves open air sessions in the city's charming alleyways.

CONCLUSIONS

Getting to know foreign countries and journeys to distant lands becomes more attractive the more fluent the communication is with local people. Inability to communicate creates barriers to fully exploring and understanding foreign cultures. Drawing is akin to knowledge of foreign languages among architects, since it is their common and universal medium of communication, understanding and means of expression. They use it to convey their moods or dreams, which might not always have a chance of materialising. Imagination suggests architectural shapes and solids, which either occupy imaginary places or are reminiscent of real, specific spaces. The architect moulds space, organises it and cannot remain indifferent to its inherent values, be they natural, open landscape or cultural landscape, mainly that of a city. That is why architectural education, despite the fact that it falls into the category of technical studies, cannot be deprived of elements of artistic education, because drawing is a professional tool for expressing project intentions, while the ability to perceive the phenomena in human surroundings helps discover clues, which can be inspiring when understood.

REFERENCES

1. Białkiewicz, A., *Rola Rysunku w Warsztacie Architekta: Szkoła Krakowska w Kontekście Dokonań Wybranych Uczelni Europejskich i Polskich*. Kraków: Wydawnictwo PK (2004) (in Polish).
2. Zychowska, M.J. and Białkiewicz, A., *Architecture and its language. Proc. History and Modernity, Architectural Design Conf.*, Istanbul, Turkey (2014).
3. Kovtun, Y., *Malevich's Architectons*. In: *Devoted to Russian Avant-garde: in Memory of Yevgeny Kovtun*. Sankt Peterburg: Palace Editions, 16 (1998).
4. Jencks, C., *The New Paradigm in Architecture. The Language of Post-Modernism*. New Haven: Yale University Press, 235-264 (2002).
5. Cook, P., *Retrospective*. Berlin: Catalogue to the Exhibition, Museum for Architectural Drawing, 5 (2017).
6. Gössel, P. and Leuthäuser, G., *Architecture in the Twentieth Century* Benedikt Taschen, 312-313, 174-176 (1994).