

## Aspects of teaching architecture in the context of educators' professional experience

Andrzej Bialkiewicz

Cracow University of Technology  
Kraków, Poland

**ABSTRACT:** The professional experience of educators has determined the teaching of architecture for centuries. Professional skills usually influence the way of teaching and approach to the subject. Over time, education has been undergoing changes resulting from the need to adapt teaching to evolving needs and possibilities, but this is also due to the development of architecture in the availability of new materials and changing fashion. In all forms of education of architects, including academic education, the teachers have been practising professionals. This is true nowadays for most of the architectural schools. Given the competencies expected of architectural graduates, it is the right principle. Therefore, all teachers of architecture should have professional experience: architects should have practice in design and implementation, while artists should have significant achievements in the field of art. In the process of educating architects, it is advisable not to employ teachers who are only theoreticians and do not practise their professions.

### INTRODUCTION

Architectural education has changed over centuries to meet new requirements as architecture developed to make use of new building materials and follow new trends. In this article are presented some aspects of the teaching of architecture, which require the educators' professional experience. Special attention is paid to the teaching of freehand drawing and the professional experience of the teachers of art classes at architectural faculties.

The author has 40 years' experience in teaching freehand drawing to architectural students at faculties of architecture in Poland and abroad, and has also conducted research on the teaching of freehand drawing in Poland and Europe. For the past two years, the author has worked as a consultant to the team developing the Act on Higher Education, which required an analysis of architectural education and the professional experience of teachers beyond education. Based on the analysis of the accumulated information, an attempt is made to outline the transformations and permanent elements in the process of teaching architecture.

### EDUCATION OF ARCHITECTS AND THE EDUCATORS' PROFESSIONAL EXPERIENCE

The first person to write about the knowledge indispensable for the architect and whose writings have survived until now was Marcus Vitruvius Pollio, known as Vitruvius. In the 1st Century BC, he stated that:

*The architect should be equipped with knowledge of many branches of study and varied kinds of learning ... This knowledge is the child of practice and theory. Practice is the continuous and regular exercise ... (...) It follows, therefore, that architects who have aimed at acquiring manual skill without scholarship have never been able to reach a position of authority to correspond to their pains, while those who relied only upon theories and scholarship were obviously hunting the shadow, not the substance. But those who have a thorough knowledge of both, like men armed at all points, have the sooner attained their object and carried authority with them [1].*

Vitruvius' text shows that as early as the 1st Century BC it was obvious that practical skills formed a significant part of the architect's education, besides theoretical knowledge. Both could be learnt from practising architects.

In Poland and elsewhere in Europe, the initial development of architecture could be attributed to the activities of religious orders in general and to the Cistercians in particular [2]. They arrived in Poland about 1140AD, bringing their artistic and architectural concepts from the Morimond Abbey in Burgundy [3]. The monasteries were built by the foreign monks with the help of local workers [4]. Their architecture was influenced by the local style. The Cistercians provided local masons with practical training in construction, structural engineering, surveying and organising the

construction process. Later, besides Cistercian builders in Poland, there appeared *thatches*. They were travelling groups consisting of masons, sculptors and stonemasons. They were active during the pre-location period, i.e. before cities were granted city rights. Little is known about the training to become a builder in *thatches*. When a city was granted rights, *thatches* turned into guilds [5].

Guild training was not precisely defined. In the Middle Ages, the dominant feature was practical skills training provided by experienced practitioners. In the 17th Century, guild training gradually declined. One reason for this was the so-called *servitorate*, i.e. the privilege which excluded from guild jurisdiction those working for the royal court. This form of activity was especially popular in the 17th and 18th Centuries. Royal servitorates were granted to Tylman van Gameren (1632-1706), Jakub Fontana (1710-1773) and Dominik Merlini (1730-1797). They were notable architects who carried out design and construction, but did not teach architecture. However, they transferred their practical knowledge and experience to the teams of builders who worked under their guidance.

From the mid-16th Century, Jesuit schools played a significant role in the teaching of architecture. On the whole, Jesuit colleges were important elements of European and South American education systems until the mid-17th Century. The first Jesuit college in Poland was set up in Braniewo (Collegium Hosianum) in 1564, and was followed by the colleges in Pułtusk, Vilnius and Poznań in 1566, 1570 and 1575, respectively. The Vilnius college was transformed into the Vilnius Academy and awarded university status in 1579. By the end of the 16th Century, there were 12 Jesuit colleges in Poland.

In 1773, during the dissolution of the Order in Poland, 51 colleges passed under the management of the National Education Commission. The teaching of architecture was carried out on two-levels: higher education of Jesuit priests as teachers of mathematics, physics, architecture and Greek, as well as *...the teaching of the young nobility in colleges* [5]. Among the teachers of architecture were Tomasz Żebrowski (1714-1758), author of the astronomical observatory of Vilnius University and Gabriel Lenkiewicz (1722-1798), author of the reconstruction of the Church of St Johns in Vilnius. There were lectures on civil and military architecture, geometry, hydrostatics and mechanics. Besides technical knowledge, practical training was provided. Architecture was taught by outstanding practitioners of the profession.

At that time, civil and military architecture was also taught in knights' schools, such as the Moscow School of Mathematics and Navigation (1701), the Knights' Academy in Berlin (1705) and the Engineering Academy in Vienna (1718). Apart from war techniques, architecture, engineering and technical matters indispensable for the architect were taught. In 1765, King Stanisław August Poniatowski established the Knights' School in Warsaw. It prepared young men for military and public service. In addition to architecture, the curriculum included geometry, surveying, Polish history, general history, philosophy, Latin, Polish language, French language, German language, law and economics. Historical documents reveal that architecture was taught by practising professionals.

Organised architectural education appeared in Italy during the Renaissance. One of the oldest academies of painting, sculpture and architecture is St Luke's Academy in Rome (Accademia di San Luca), which was founded in 1593. A considerable part of architectural studies consisted of designing and reconstructing buildings in Rome and other cities, such as Pavia, Camerino, Faenza, Gubbio, Urbino, Amelia, Cantalupo, Frascati, Civita Castellana, Castelnuovo, Manziana, Cisterna and Caprarola. Competitions were organised for the projects and participants included acclaimed architects. The teachers, founders and managers of the Academy were practising professionals. Since the 1930s, the Academy has not carried out didactic activities.

On 31 December 1671, the Royal Academy of Architecture was founded in Paris. Its members included outstanding architects, such as Louis Le Vau, Claude Perrault, Jules Hardouin-Mansart and André Le Nôtre. Their presence had a great impact on the education in the school. The statute from 1717 stipulates that every man who exhibits talent and interest in architecture, regardless of age, will be able to participate without restrictions in public lessons [6]. Following the example of St Luke's Academy in Rome, the school also organised competitions for architectural projects. They were initiated by Jacques-François Blondel. Drawing was the basic element of the curriculum.

Competition drawings provide information about the preferred trends and methods of studying architecture. The Royal Academy was a state school. In the 18th Century, many private schools of architecture emerged in France. They followed the teaching methods of the Royal Academy in Paris and St Luke's Academy in Rome. At present, the Department of Architecture is part of the Academy of Fine Arts, which continues the tradition of its predecessors and creatively combines the intellectual, artistic, technical and professional development of the architect. Members of the Academy and its lecturers were active professionals, so that they could share their theoretical and practical knowledge with the students. The Academy graduates became noted architects, whose works were perfect combinations of artistic and technical qualities.

In Austria, architectural education originated with the establishment of the school of painting, sculpture and architecture in Vienna in 1692. Jacob van Schuppen transformed it into the Imperial and Royal Court Academy of Painters, Sculptors and Architecture in 1725. It was awarded Higher School status in 1872. On 6 November 1815, the Polytechnic Institute was opened, but architecture and construction remained in the structure of the Academy of Fine Arts, whose deputy rector was Prince K. Metternich. In the Academy ...

*The subject Land- und Wasserbaukunst covered general knowledge of building materials, brickwork, strength of materials, general construction of buildings and devices, their aesthetics and practicality, construction and architectural drawing. Among the lecturers were the director of water engineering in Lower Austria, Johann Kudriaffsky (...), military engineer Joseph Purkinje (...) and Joseph Stummer von Traunfels, initially as a lecturer (...) from 1836 as a professor. The latter was an architect with a practical background (a bricklayer's son) who was very popular in Vienna in the mid-19th century. He designed many residential and public buildings including the building of his school. Already in 1842, Stummer designed the division of the faculty into three departments: civil and water engineering, construction of bridges (mainly railway), architecture. This division was partly implemented in 1866 when the school was reorganized [7].*

*With the emergence of the Vienna Polytechnic in 1815, a competition started between the Polytechnic and the Academy of Fine Arts for the right to educate future architects and constructors. As the controversy was not settled, architecture could be studied at the Polytechnic and the Academy of Fine Arts [8].*

The architectural department at the Polytechnic had an engineering character. It ought to be stressed that the lecturers and professors in both institutions were practising professionals.

In 1757, the Saint Petersburg Academy of Fine Arts was established. Architecture was taught there by remarkable artists, such as the first professors: the painter Louis-Joseph Le Lorrain; the architect Nicolas-François Gillet; the architect and sculptor Jean-Baptiste Vallin de la Mothe (extension of the Winter Palace in Saint Petersburg, the Small Hermitage in Saint Petersburg); and Georg Friedrich Schmidt, an engraver from Berlin.

During the years that followed, professors of architecture included such personalities as A.D. Zacharow (the Admiralty building in Saint Petersburg, Saint Andrew's Cathedral in Kronstadt, Stock Exchange in Saint Petersburg); A.N. Voronikhin (Cathedral of the Kazan Icon of the Mother of God in Saint Petersburg, State Treasury building in Saint Petersburg, Mining Institute in Saint Petersburg); and J.F. Thomas de Thomon (gallery at the Lubomirskis' Łańcut Castle, Eisenstadt baths, Odessa opera house). Students were allowed to participate in their projects, which was an excellent method of teaching architecture, because the design concerned a specific public building that was to be implemented. In this way, theory was combined with practice and the problems of style, function and technical issues were also considered. Over time, the group of professors who were renowned in Europe grew smaller.

In 1893, a new statue was developed for the Academy. This period in the Academy's history is famous for a large number of highly talented graduates. In 1944, the school was renamed Ilya Repin St Petersburg State Academic Institute for Painting, Sculpture and Architecture. At the St Petersburg Academy, the lecturers in architectural design and other technical and artistic subjects were professionals recognised in their fields. Very modern and attractive didactic methods were used; and the professors worked with students on the projects intended for realisation. The past and present graduates are outstanding architects.

German architectural education at an academic level developed at the turn of the 18th and the 19th Centuries. In 1799, Bauakademie was founded in Berlin. In 1825, the Faculty of Architecture was established at Karlsruhe Polytechnic followed by the emergence of architectural faculties at polytechnic schools in Brunswick, Stuttgart, Hannover, Dresden, Munich and Darmstadt. In Berlin, architecture was taught at the Academy of Arts from 1696. In 1776, the School of Engineering and Architecture was established and dissolved 10 years later. In 1793, the Winter School opened providing courses in surveying, mathematics, hydraulics, mechanical and structural engineering. It transformed into the Royal Building Academy in 1799. A syllabus developed there was described as ...*A set of useful guidelines and information about building* [9]. Practical aspects of architectural education were emphasised.

The chapter titled *Reflections on the need to unite different branches of the art of building, in the sense of practice and theory* presented the building problems at the time. The curriculum included mainly subjects connected with architecture. Great importance was attached to the practical preparation of school graduates. Among the professors were Heinrich Gentz (the theatre in Lauchstadt, Queen Luise Museum in Berlin, in collaboration with Karl Friedrich Schinkel) and Friedrich Gilly (the Mint in Berlin in collaboration with Heinrich Gentz, K.H.G. von Hoym Mausoleum in Brzeg Dolny). In 1820, the Academy employed Friedrich Schinkel, a remarkable architect and author of innumerable objects in western and central Europe (the Pomona Temple in Potsdam, the New Guardhouse in Berlin, St John's church in Berlin) [10].

In 1879, the Building Academy was merged with the School of Crafts and the Technical University in Berlin was established. The educational programmes combined architectural and engineering subjects [11]. The architectural schools in Berlin from the late 17th Century Academy of Fine Arts to the present Faculty of Architecture have always employed outstanding practising architects. In the teaching process, emphasis was put on sharing knowledge and practical engineering experience in design and construction. However, artistic issues were not disregarded. Art classes are still taught at many European faculties of architecture. Despite cultural differences, the principles of education seem to be similar, while drawing tasks are closely connected with the teaching of design subjects. The process of selecting students for such faculties focused on talented individuals and education is based on the Vitruvian principles of creating things that would be durable, functional and beautiful (*firmitas, utilitas, venus* [venustas]) [12].

Attempts to establish a school of architecture in Kraków date back to the 17th Century. Lectures in architecture were included in the Kraków Academy syllabus in the first half of the 17th Century. A course of architecture was taught at Kraków Academy of Fine Arts in 1913, and the Faculty of Sculpture and Painting was set up in 1922, with the Faculty of Architecture, which survived until 1929. In 1945, the Faculty of Architecture was founded as one of the polytechnic faculties of the Mining Academy. In 1954, the faculties were transformed into an independent school under the name Kraków Polytechnic (currently Cracow University of Technology), with the Faculty of Architecture active until today. Educators at the Faculty of Architecture always have been outstanding practising designers.

In analysing architectural education from the 1st Century BC until now, it is easy to notice the changing methods and preferences. Yet, practical skills especially have been valued. Besides engineering and technical subjects, art classes were introduced, because artistic aspects were considered indispensable for the work of the architect-creator. The educational programme was modelled on famous schools of architecture. The educators invariably were outstanding practising professionals and this fact had a great influence on the education of future architects.

#### TEACHING DRAWING TO ARCHITECTS AND EDUCATORS' PROFESSIONAL EXPERIENCE: EXAMPLE OF THE FACULTY OF ARCHITECTURE AT CRACOW UNIVERSITY OF TECHNOLOGY

Freehand drawing always has played an essential role in the teaching of architecture at the organised academic level and before this form of education appeared. As stated earlier, in 1945, the Faculty of Architecture was founded as one of the polytechnic faculties of the Mining Academy in Kraków. Head of the Freehand Drawing Department was Professor Ludomir Słędziński (1889-1980), an artist painter. He developed the syllabus and employed painters and graphic artists as teaching staff. They proved to be excellent educators and artists. While working on the syllabus Słędziński's only guideline was that its target be students of architecture. An important factor was Słędziński's experience as a teacher and artist. When Słędziński, graduate of the St Petersburg Academy of Fine Arts, was a student, painting, drawing and supporting subjects, such as anatomy or perspective, were taught at faculties of architecture, as well as those of sculpture and painting. He enriched his artistic experience while travelling abroad [13].

L. Słędziński was an experienced teacher of drawing and painting. In the 1920s, he was Head of the Drawing School at the Vilnius Society of Fine Arts Creators. On 30 October 30 1925, the Minister of Education and Public Enlightenment appointed him Deputy Professor and Head of the Decorative Painting Department in the Faculty of Fine Arts at *Stefan Batory* University in Vilnius. In 1928, the President of the Republic of Poland awarded him the title of Associate Professor. In 1938, he became full Professor. In the academic year 1929/1930, Słędziński was Deputy Dean, and then Dean of the Faculty of Fine Arts at *Stefan Batory* University in Vilnius. This background had an influence on the way he defined the goals and shape of the freehand drawing syllabus for the Faculty of Architecture from the moment the Department of Drawing was established. In the late 1950s, the Minister of Higher Education worked on general freehand drawing syllabuses for faculties of architecture [14]. Słędziński argued with the Minister pointing out the incompatibility of the programmes with the teaching of drawing at architectural faculties. There were regular meetings of the heads of the Departments of Drawing, Painting and Sculpture at the Faculties of Architecture at Technical Universities in Warszawa, Kraków, Gdańsk and Wrocław, to exchange views and experiences with regard to the teaching of drawing to architects.

Subsequent head of the Department was professor Krystyna Wróblewska, an artist painter with significant artistic achievements and considerable experience in the teaching of drawing and painting to architects. She completed studies in the Faculty of Fine Arts at *Stefan Batory* University in Vilnius in 1935, and on 9 September 1937 she received the diploma of an artist painter. The culture and atmosphere of Vilnius had a great influence on her work. In 1938, she studied in France, mainly in Paris and was about to begin work at the Department of Monumental Painting at Vilnius University in the academic year 1939/40. In 1945, she arrived in Kraków and was employed as a senior assistant in the Department of Freehand Drawing. During her term of office, staff partly changed and new employees appeared. The artists working at the Department have participated in national, international and single-artist exhibitions. The syllabus was constantly adapted to meet the needs of students of architecture.

In 1974, an artist painter Zbigniew Gostwicki became Head of the Department of Drawing, Painting and Sculpture. He was an experienced educator who took up the Chair of Freehand Drawing on 1 September 1946. He studied in the Faculty of Painting at the Academy of Fine Arts in Kraków in the years 1926 to 1932. In April and May 1931, he was a student of the impressionist painter, graphic artist and teacher, Józef Pankiewicz, in Paris. Between 1932 and 1938, he studied philosophy at the Philosophical Faculty of Jagiellonian University in Kraków and received his Master's degree in philosophy of art on 28 January 1951. In 1975, he became an Associate Professor.

Between the years 1977 and 1982, the Department of Drawing, Painting and Sculpture was headed by Associate Professor Roman Husarski. He graduated from the Faculty of Sculpture at the Academy of Fine Arts in Kraków in 1948. In 1966, he received a PhD in technical sciences, and in 1976 was conferred his habilitation. He invented the technique of piropiktura (*pyro-painting*), in which he did his own projects [15]. His works include sculptures, as well as ceramic and stone mosaics. On the whole, there was a return to the methods and principles developed by Professor Słędziński and Professor Wróblewska. Emphasis was put on architectural drawing and various artistic techniques. All the staff members participated in exhibitions of their artistic works and realised their architectural projects.

Between the years 1982 and 2000, Professor Jan Bruzda became Head of the Department. He was a designer and maker of organic stained-glass windows in religious and public buildings. He also produces painting, murals and *spatial painting* with his own techniques. He is the author of numerous scientific publications. Between 2000 and 2010, the Department was headed by Professor Ewa Gologórska-Kucia.

The author of this article has been Head of this Department since 2011. The staff members, apart from teaching and research activities, exhibit their works, as well as designing and realising their projects.

History is made by individuals. The history of the present Department of Drawing, Painting and Sculpture also can be derived from the individual artistic personalities of the people who were its heads. Although they changed, the end of each person's term in office did not bring about a total change of the programme or methods of teaching. This seems to have created a sense of continuity, which stands as testimony to the tradition of the University. However, the programme has evolved to meet the present needs of students, would-be architects, and to introduce some variety, because too much routine can hinder progress.

## CONCLUSIONS

The graduate of the Faculty of Architecture should have practical professional skills besides theoretical knowledge. Since time immemorial, teachers of architecture, also at an academic level, have been practising professionals although the forms and methods of teaching have changed [16]. For this reason, architectural education should be provided by the educators who are active in their profession. It is hard to imagine that architectural design could be taught by someone who has not completed a project. The same applies to the teaching of the history of architecture or contemporary architecture. It seems impossible to teach based only on the available literature without having seen in reality the objects of lectures. Modification of syllabuses to integrate subjects is a case in point [17].

The teachers of drawing at architectural faculties should also be practising professionals. Drawing stimulates and develops spatial imagination, which is indispensable at every stage of design [18]. Drawing is a tool making it possible to visualise the forms created during the process of design. Teaching art subjects is usually done by teams comprising architects, painters, graphic artists and sculptors. Apart from doing research, all these people should practise their professions since drawing, painting and sculpture in the teaching of architecture are closely connected with the teaching of design subjects. While reviewing students' works, the educators share with them their knowledge and experiences with respect to other aspects beside the form. These can include the structure of the form, the composition of it, the materials used and positioning in the existing space. This applies to both historical and contemporary objects. Such information not only stimulates and develops imagination; it extends the knowledge indispensable for architectural students.

Academic staff of higher education institutions are subject to evaluations regarding their research activities (publications, active participation in scientific conferences, acquisition of and participation in research projects, obtaining international grants, patents) or artistic, didactic and organisational assignments. Research and creative activities have played a particularly significant role in the process of evaluation of university faculties.

The present Higher Education Act of 20 July 2018 assumes that only newly defined scientific disciplines will be evaluated instead of faculties. For researchers and educators evaluated in the disciplines of architecture and urban planning, it is highly important to know the type of research and creative activity to be assessed, because the evaluation has a significant impact on their further development. The point is, to properly conduct the process of educating architects, it is necessary to involve practitioners of architecture, that is designers who actively practise their profession, and are not just theoreticians.

It seems that architectural design, urban planning or construction, material engineering, computer techniques in design and other architectural subjects should not be taught by people who do not design or implement projects. Doing research alone is insufficient for someone employed as a researcher and educator. Unfortunately, practising design, which is most important, has not been promoted so far in the evaluation of the discipline of architecture and urban planning.

## REFERENCES

1. Witruwiusz, *O Architekturze*. Ksiąg Dziesięć. Kumaniecki, K. (Trans.), Warszawa: Państwowe Wydawnictwo Naukowe, 11-12 (1956) (in Polish).
2. Gieysztor, A., Cistersiensi. *Biuletyn Historii Sztuki i Kultury*, R. XI, Nr 3/4, 27-54 (1949) (in Polish).
3. Wyrwa, A.M., *Powstanie Zakonu Cystersów i jego Rozwój na Ziemiach Polskich w Średniowieczu*. In: Wyrwa, A.M., Strzelczyk, J. and Kaczmarek, K., *Monasticon Cisterciense Poloniae, Kultura i Dzieje Męskich Klasztorów Cysterskich na Ziemiach Polskich Dawnej Rzeczypospolitej od Średniowiecza do Czasów Współczesnych*. 1, Poznań: Wydawnictwo Poznańskie (1999) (in Polish).
4. Manteuffel, T., Rola cystersów w Polsce wieku XII. *Przegląd Historyczny*, 41, 180-202 (1950) (in Polish).
5. Piwocka, M., *Z Dziejów Szkolnictwa Architektonicznego w Polsce*. Ministerstwo Budownictwa Miast i Osiedli, Instytut Urbanistyki i Architektury, Seria Prac Własnych, 1, Warszawa (1951) (in Polish).

6. Pérouse de Montclos, J.M., *Concours de l'Académie royale d'architecture au XVIII-e siècle*. Paris, 9 (1984) (in French).
7. Brzozowski, S., *Studia Techniczne Polaków w Wiedniu do Wiosny Ludów, Studia i Materiały z Dziejów Nauki Polskiej*. Seria D, 9, Warszawa, 19 (1978) (in Polish).
8. Żeleńska-Chełkowska, A., *Próby Wprowadzenia Nauk Technicznych w Uniwersytecie Jagiellońskim w Latach 1776-1833*. Wrocław, 49 (1966) (in Polish).
9. Neumeyer, F., Die verständige Vereinigung des Nützlichen mit dem Schönen. Friedrich Gillys Postulat der Wiedervereinigung von Poesie und Philosophie, Kunst und Wissenschaft als Programm für die Bauakademie, 1799-1999 Von der Bauakademie zur Technischen Universität Berlin. Geschichte und Zukunft. Aufsätze, Berlin, 57 (2000) (in German).
10. Schinkel, K.F., *Guide to His Buildings*. Deutscher Kunstverlag, Berlin (2007) (in German).
11. Suckale, R., *Die Bauakademie nach Schinkel und die sogenannte Berliner Schule 1799-1999 Von der Bauakademie zur Technischen Universität Berlin*. Geschichte und Zukunft. Aufsätze, Berlin, 76 (2000) (in German).
12. Ilkovič, J., Špaček, R. and Ilkovičová, L., Internal and external evaluation in entrance procedures at FA-STU. *World Trans. on Engng. and Technol. Educ.*, 16, 4, 325-333 (2018).
13. Sleńdziński, L., Wspomnienia. Kraków, Grudzień 1950, 1-2. Maszynopis, Warszawa Zbiory Specjalne Instytutu Sztuki PAN, L.Ś. Inv. 31, k. 10-12, 51. In: Białkiewicz, A., Ludomir Sleńdziński 1889-1980. Pierwszy Rektor Politechniki Krakowskiej, *Biuletyn Muzeum Politechniki Krakowskiej*, 24-25 (2009) (in Polish).
14. Program Ramowy Przedmiotu: Rysunek Odręczny, Rzeźba i Modelowanie. Kierunek: Architektura. Programy Ramowe Przedmiotów dla Grupy Specjalności Architektura, Ministerstwo Szkolnictwa Wyższego, Zarząd Wyższych Szkół Technicznych, Warszawa (1957).
15. Kostuch, B., *Kolor i Blask. Ceramika Architektoniczna oraz Mozaiki w Krakowie i Małopolsce po Roku 1945*. Kraków, 42-47 (2015).
16. Makowska, B., Teaching freehand drawing at the Faculty of Architecture in the context of technological change. *INTED Proc.*, Valencia, 5008-5012 (2018).
17. Żychowska, M.J., Teaching, drawing to a new generation of engineers architects. *World Trans. on Engng. and Technol. Educ.*, 17, 1, 60-65 (2019).
18. Domarzewski, A., Drawing and painting? Definitely! The role of painting and drawing workshops after the first year of studies at the Faculty of Architecture. *Technical Transactions*, 5-10 (2015).