

Article

Drawing Skills of Candidates for Architectural Studies vs. Learning Outcomes of Graduates. Comparative Research Based on the Example of The Faculty of Architecture, Poznan University of Technology

Agata Gawlak * , Ewa Prusze-wicz-Sipińska and Wojciech Bonenberg

Faculty of Architecture, Poznan University of Technology, 60-965 Poznan, Poland;
ewa.prusze-wicz-sipinska@put.poznan.pl (E.P.-S.); wojciech.bonenberg@put.poznan.pl (W.B.)

* Correspondence: agata.gawlak@put.poznan.pl; Tel.: +48-697-466-811



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Abstract: Major changes in the organisation of the teaching process at universities in Poland had to be introduced in response to the current pandemic situation and threat of further spread of SARS-CoV-2 virus. This article presents the results of the research conducted at the Faculty of Architecture, Poznan University of Technology in view of the pilot, experimental entrance exam that excludes the evaluation of drawing skills of candidates for architectural studies in the 2020/21 recruitment process. The purpose of the research was to find a correlation between the quality of candidates accepted for the BSc (engineer) programme studies, evaluated on the basis of their drawing skills demonstrated during the entrance exam and the learning outcomes of graduates. For that purpose, the authors hereof have carried out an analysis with the use of the Spearman Rank Correlation formula. The comparative analysis has shown that candidates whose drawing skills were evaluated highly during the entrance exam did not necessarily rank as the top grade scoring graduates of the first degree study programme, and thus, it has further been shown that good drawing skills at the beginning of the study programme do not guarantee top learning results at the end of the studies. In effect, the research should become a starting point for a discussion in Poland on whether there are any justified grounds for entrance exams in drawing or whether a portfolio of works may replace it and be an effective recruitment criterion.

Keywords: architectural education; architectural studies; admission exam in drawing; higher education; drawing

1. Introduction

Instruction on drawing and design skills constitutes the most important part of architectural education [1]. The global research conducted so far on architectural education, including the applicable recruitment criteria, shows a wide range of used criteria, which among others, include: evaluation of portfolio of works, results of secondary school leaving exams (A-levels and O-levels) and interviews or exams in drawing. According to the research, there is not one, uniform recruitment procedure [2]. All of the applied criteria are intended to verify the suitability of candidates in view of successful completion of the study programme and pursuit of professional career. It is certainly worth attempting to systematise the applicable recruitment criteria and requirements at the regional, national, and international levels [1]. Other studies also show that admission requirements posed for candidates show a weak correlation with the students' performance during their studies. This means that students that ranked at low positions during the recruitment process may still score high study grades if they commit themselves to studying diligently.

At the same time, too-high requirements posed for the candidates may not result in the increased efficiency of learning outcomes and may only limit access to architectural studies [3]. Moreover, it must be remembered that architectural education should be integrated

with technological progress and innovative tools in architectural design on a continuous basis [4]. On the one hand, it might be concluded that the days of manual drawings are gone, but it is in fact to the contrary, mainly for the reason that manual drawings show individual features of their authors whereas digital computer visualisations of architectural designs will be based on standardised software options. Individual expression predetermines the superior and iconic value of the drawing [5]. Moreover, it is not just a method of vision or design presentation but is also a design method itself [6]. Architectural education in Poland is strongly dependent on applicable provisions of law. Architectural education is offered within study programmes of architecture or architecture and urban planning, with core courses in architecture and urban planning. Study programmes can be offered by state-run universities and private schools of higher education and can be taught in full-time and part-time form of a general academic or vocational profile. Moreover, study programmes may be taught as uniform (MSc) programmes or the first and the second cycle of studies (with the award of the degree of an engineer or master, respectively). However, regardless of the options described above, all study programmes are developed based on applicable laws, and in particular on the Law 2.0 [7], the Regulation of the Minister of Science and Higher Education on architectural education standards and other standards [8]. The provisions set forth for the duration of the study programme (number of semesters), the minimum number of hours of instruction and the minimum number of ECTS points required to be scored by the student in the course of the studies; in this, the score of students' drawing skills are evaluated within the fine arts classes. The Regulation in detail prescribes the core subjects or groups of subjects that are mandatory for architectural education to be taught within groups of subjects A–E:

- A. Design, including: A.1. Architectural design and urban planning and A.2. Rural design, interior design and special design customised to local conditions
- B. Designing context, including: B.1. Theory and history of architecture and urban planning, landscape architecture, heritage protection, cultural studies, environmental protection and ecology, economics of an investment process, law in the investment process and ergonomics; B.2. Engineering and technology: construction and materials technology, building structures, statics and mechanics of civil engineering structures, physics of constructions, building systems and town infrastructure; and B.3. Workshop design: drawing, painting, workshop techniques, computer techniques, modelling, mathematics and geometry.
- C. Supplementary subjects, in particular: foreign languages and electives such as philosophy and aesthetics, history of art, environmental sociology and psychology
- D. Practical placements
- E. Diploma: preparation for the submission of diploma thesis and taking the diploma exam.

Apart from requirements in the scope of groups of subjects, the legal provisions also set forth the number of hours of a practical placement each student has to complete during their studies. Nevertheless, the applicable laws fail to prescribe any uniform evaluation criteria for the positive qualification of drawing skills of candidates for the first cycle study programs or uniform M.Sc study programmes in the field of architecture. This means that university authorities in Poland enjoy discretionary powers in defining the admission criteria to architectural study programmes.

At present, the majority of state-run universities in Poland hold mandatory entrance exams for candidates for the study programmes of architecture or architecture and urban planning. These exams partly include a practical part, i.e., a drawing exam, and partly take into account grades the candidates scored in selected subjects in their secondary school exit exams. Such a procedure is applied at faculties of architecture in leading Polish universities (Universities of Technology in Gdańsk, Kraków, Wrocław or Warsaw) as well as in smaller university centres, such as Lublin or Łódź. Some private universities, including SSW in Sopot or Vistula Business Academy, departed from the evaluation of candidates' drawing skills some time ago.

Thus, a drawing exam is a regular part of the recruitment process in Poland and a condition precedent for admission to studies at various state-run universities. However, it has to be acknowledged that some students can draw well without any prior training, and some would require instruction to be able to draw well [9].

The issue of drawing skills of candidates for architectural studies is widely discussed both by academics and by researchers. Interdisciplinary qualitative and quantitative studies are conducted of which the purpose is to improve the quality of tertiary education and that of the graduates. The results of education are compared in terms of measurable parameters, including the number of candidates, admission exam grades and final grades. The necessity of such research is explained by what is expected from the graduates of architectural studies. After the period of fascination with computer-aided methods of design visualization, the job market tends to look for candidates with manual skills quite often. Conceptual designs are presented in the form of manual drawings and sketches.

The role of manual drawing in architectural education is fundamental and indisputable; thus, drawing is included in the mandatory core subjects of architectural study programmes in Poland [10]. Despite the rapid development of digital tools used in architectural design, such tools cannot replace manual drawing either in architectural education or at any stage of a professional career, yet they should be mastered by the future architects alongside the manual drawing skills in the process of their education [1]. Even if, initially, the rapid progress of digitalization of the design process and the application of specialized software seemed to be forcing manual skills out, this has not happened. The key role of manual drawing as a method of teaching consists not only in the representation of reality but also in its transformation based on the individual experience and know-how. This makes manual drawing a fundamental element of architectural education. It is not an objective in itself but rather a method of communication used by all designers [6]. It is, however, vital to fully integrate both tools as supporting the superior role of the drawing as such in the process of visual design and in education [11].

The present research was conducted at the Faculty of Architecture, Poznan University of Technology. The Faculty of Architecture, Poznan University of Technology, is a recognised unit of architectural education in Poland. It has been ranked as one of the leading universities and was awarded with the best quality assurance in 2018 in the field of architecture by the Polish Accreditation Committee (PAC). Moreover, it has been accredited by the Accreditation Commission of Universities of Technology (KAUT) and awarded with the European Eur-ace Label quality certificate. In 2017, the Faculty received an A category in the parametric evaluation of scientific units of the KEJN (Committee for the Evaluation of Scientific Units). Being a leading and highly recognised institution, it has decided to introduce a pilot solution. At present, there are almost 1000 Polish and foreign students at the Faculty. The study programme is offered in Polish and in English. Every year, 180 Polish and foreign students are admitted to the first year of studies in the field of architecture at the Faculty of Architecture. At the same time, the number of candidates usually exceeds the number of accepted students by three times and ranges from 500 to 600. Moreover, it has been regularly showing an increasing trend. In the academic year 2017/18, the number of candidates was 636, in the academic year 2018/19—2014648 and in the academic year 2019/20—580.

The entrance exam is composed of two drawing sessions, which take place within the premises of the university and comply with the most stringent confidentiality standards (works coding) and verification standards (verification of identity of candidates); the exam procedure is observed at the exam organisation by the Faculty Recruitment Committee and supervised by the Dean. The drawing sessions are supervised and recorded. Works are evaluated by two independently working committee teams. Such organisation ensures that the faculty meets the high standards of the recruitment and evaluation procedure.

Pencil technique is always used. Students draw on a white paper 100×70 in vertical orientation. The topics of examination drawing session are diverse, ranging from imagination (draw a city of the future) to drawing from nature (draw a still life or a model).

The committee evaluates work taking into account composition, proportions, spatial relations, principles of perspective, properties of objects and the use of chiaroscuro. Works are evaluated in the 2.0–5.0 scale (every 0.25).

At present, due to the COVID-19 pandemic, by the virtue of the decision of the Ministry, all forms of full-time study programmes have been suspended at universities and schools of higher education in Poland, and the organisation of the above described recruitment procedure is not permitted due to the fact that proper safety needs to be ensured for the candidates and academics to protect them against the virus.

For that reason, exam procedures applicable in the recruitment for architectural studies at renowned European universities, the authors hereof have evaluated the performance of the graduates (overall grade of studies) in the field of architecture with their results scored at the entrance exam before their admission. The research aimed to answer the question whether there was any correlation between the quality of the candidate (his/her drawing skills) at the beginning of architectural education and their learning results in the course of studies and upon the completion of studies.

2. Materials and Methods

The research was conducted on a sample group of graduates of the faculty of architecture—BSc (Engineer) programme (the first cycle programme) in the field of architecture, who completed their studies in the period from 2018 to 2020. In total, 360 graduates were analysed (108 of the 2018 graduates, 114 of the 2019 graduates and 138 of the 2020 graduates).

The grade scored by the candidate (quality of the candidate) was compared to the overall grade of studies of the graduates (quality of the graduate), taking into account the then applicable principles of recruitment.

The entrance exam for candidates for architectural studies is composed of two stages:

- The grades the candidates scored in selected subjects in their secondary school exit exams (maximum allocated points—500) (M);
- the drawing exam (maximum allocated points—500) (R).

First, the quality of the candidate expressed by the number of points allocated to him/her at the entrance exam was compared to the quality of the graduate of the first cycle programme in the field of architecture expressed with the average studies grade converted into relevant number of points. The purpose of such a comparison was to find a correlation between the entrance exam results and the final result at the completion of the BSc (engineer) study programme, and in particular to learn whether top ranks at the entrance exam (M+R) translate into high performance (quality) of the graduate (architect, Eng.). The authors in particular wished to analyse the final, overall studies grade in view of partial results of the entrance exam, i.e., points allocated for the grades in the secondary school leaving exams (M) and points allocated for the drawing stage (R). For that purpose, the Spearman Rank Correlation formula is used: nonparametric measure of the strength and direction of association that exists between two variables measured on at least an ordinal scale (Figure 1a–c). A candidate's drawing skills were evaluated by the grade obtained in the recruitment process in the 2–5 scale (translated for recruitment purposes into the scoring scale of 0–500 points). In addition, the results obtained by graduates of architectural studies are marked in the 2–5 scale. On each graph, graduation years are colour-coded (2018—red, 2019—blue, 2020—black).

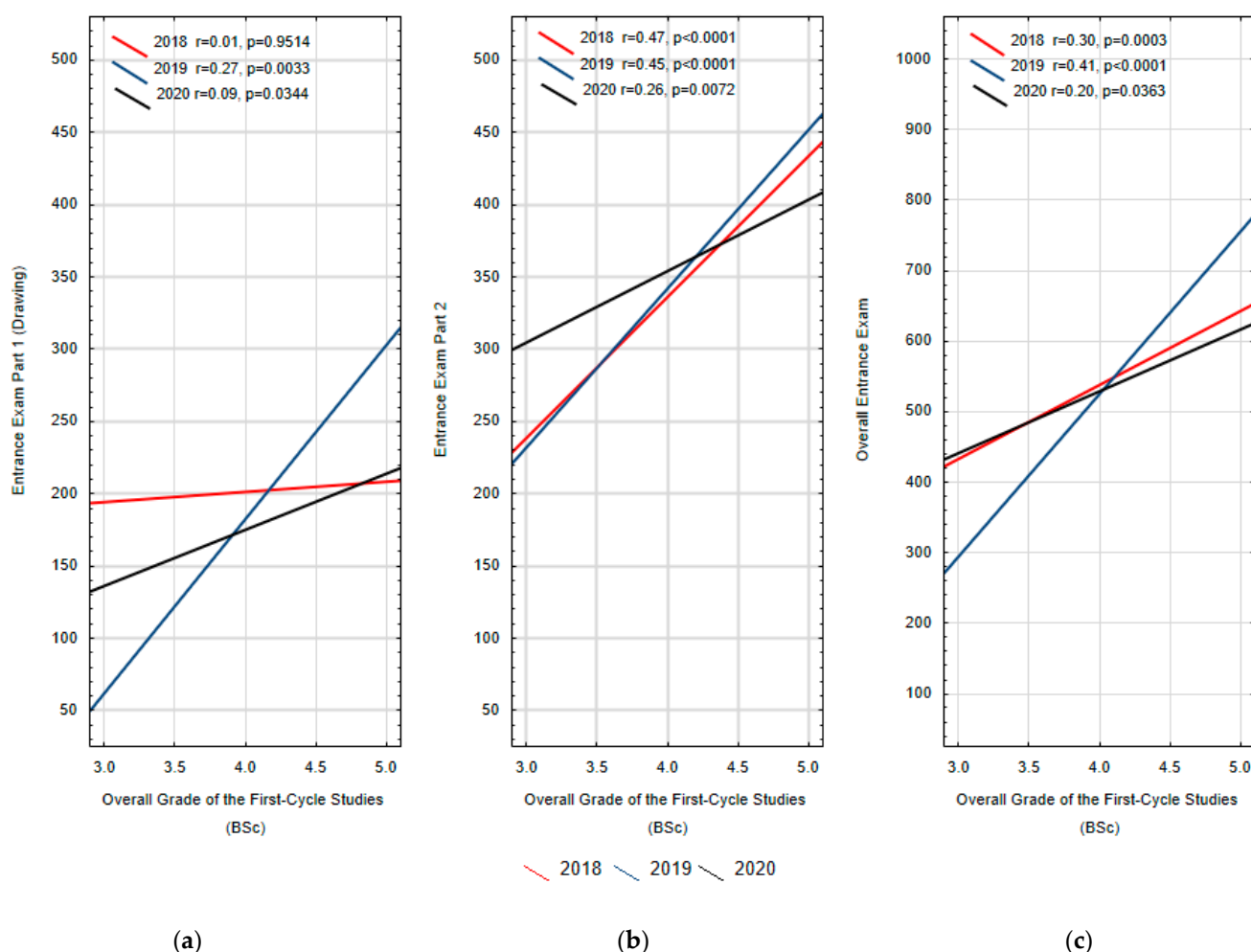


Figure 1. (a) dependence between the entrance exam (R) and quality of the graduate, (b) dependence between the entrance exam (M) and quality of the graduate, (c) dependence between the entrance exam (R+M) and quality of the graduate.

The analyses were made separately for the 2018 graduates, the 2019 graduates and the 2020 graduates. The analysis measured the correlation between the quality of the graduates of architectural studies (first cycle programme) and three variables:

- drawing skills before the commencement of studies expressed as the number of points allocated in the drawing stage of the entrance exam (R) (see Figure 1a);
- points allocated for results of the secondary school leaving exams (M) (see Figure 1b);
- total number of points scored in the entrance exam (M+R) (see Figure 1c).

In Figure 1, the horizontal axis shows final study results in the 3 to 5 scale, while the vertical axis shows:

- in Figure 1a—result of entrance examination in drawing (part 1);
- in Figure 1b—result based on the candidate's secondary school matura result (part 2);
- in Figure 1c—total entrance examination result.

The correlation is depicted by lines created by a cloud of dots (the number of dots equals the number of candidates).

Next, at the second stage of the research, statistical analysis was conducted to learn whether there is any correlation between rank of the candidate in the entrance exam and his/her performance in the subsequent years of studies during the first cycle programme and his/her learning outcomes in artistic subjects.

For that purpose, the entrance exam score in drawing was compared to all the grades a given candidate obtained in artistic subjects during the overall study programme, i.e.,

in the “Drawing” course in semester 1, 2, 3 and 4 (see Figure 2a–d)) during the first two years of studies. The Spearman Rank Correlation formula was used again.

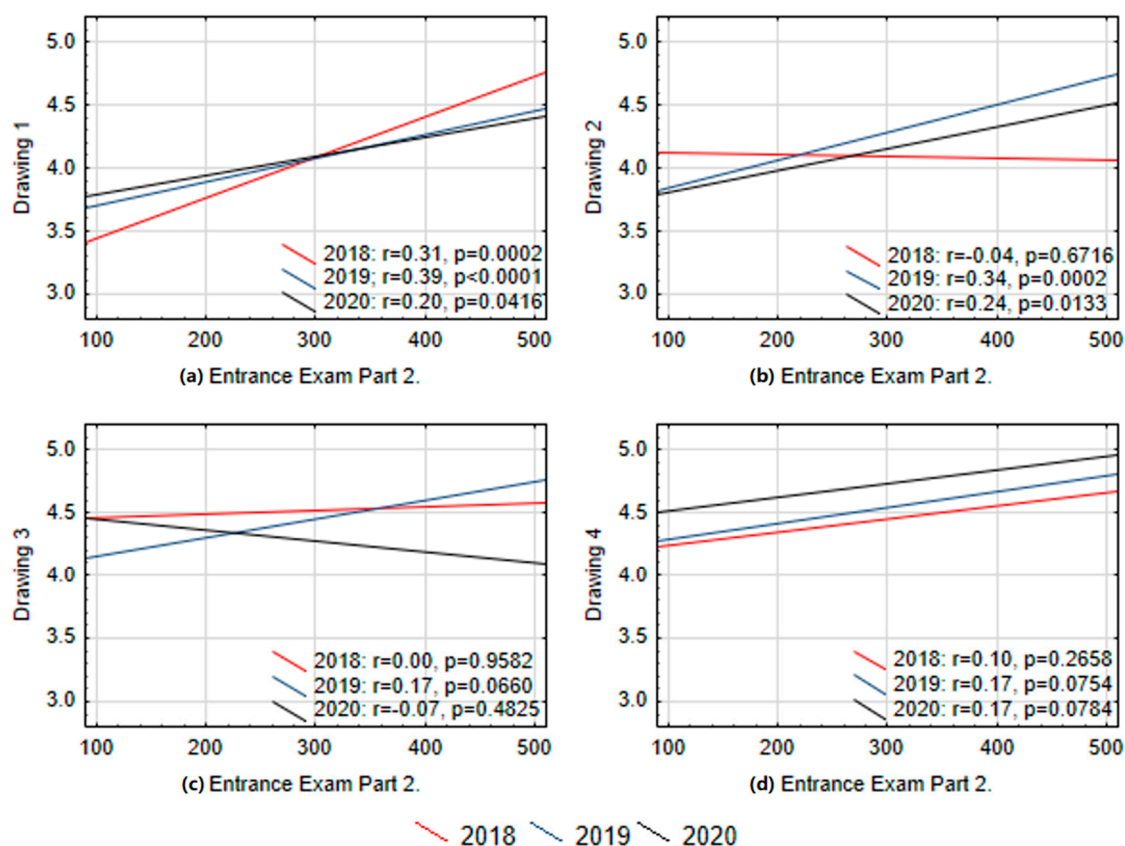


Figure 2. (a) dependence between results scored upon completion of semester 1 and the entrance exam (R), (b) dependence between results scored upon completion of semester 2 and the entrance exam (R), (c) dependence between results scored upon completion of semester 3 and the entrance exam (R), (d) dependence between results scored upon completion of semester 4 and the entrance exam (R).

This method was used to find the correlation between candidates’ drawing skills at the beginning of their architectural education, evaluated in the recruitment procedure at the entrance exam and their performance during the first two years of studies in the artistic subjects based on their progressing drawing skills.

A candidate’s drawing skills are marked with the use of a grading scale from 2 to 5 (translated for recruitment purposes into the scoring scale from 0 to 500). In the course of the study, student drawing skills are marked with semester grades from 2 to 5.

In Figure 2a–d, the horizontal axis marks entrance examination results and the vertical axis results obtained in drawing classes in particular semesters. Again, the correlation is shown by lines made of the dot cloud and the number of dots equals the number of graduates included in our study.

Figures 3–5 visually show the correlation between the quality of the graduates of architectural studies (first cycle programme) and drawing skills before the commencement of studies expressed as the number of points allocated in the drawing stage of the entrance exam (R).

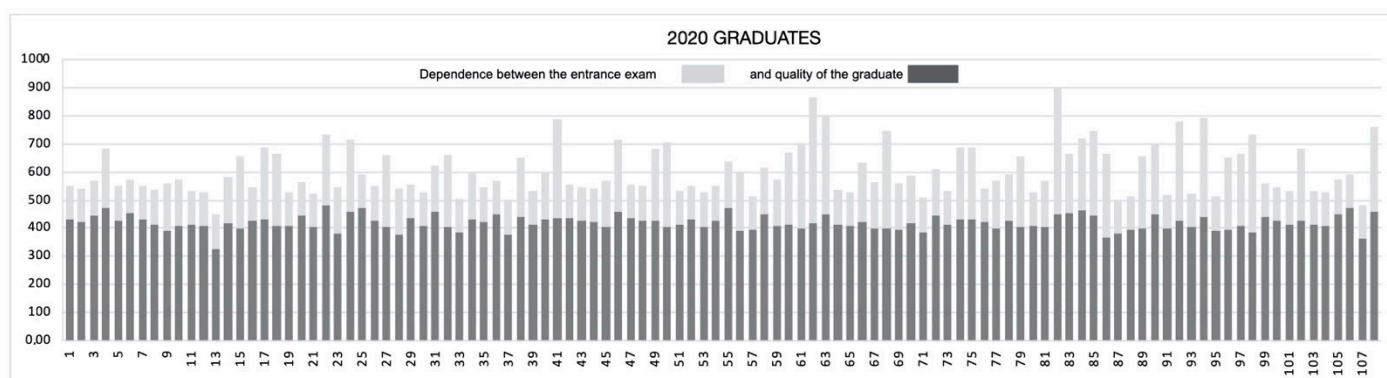


Figure 3. The ranking of 2020 BSc (Engineer) programme graduates vs. their position on the admission list (result of entrance exams in drawing).

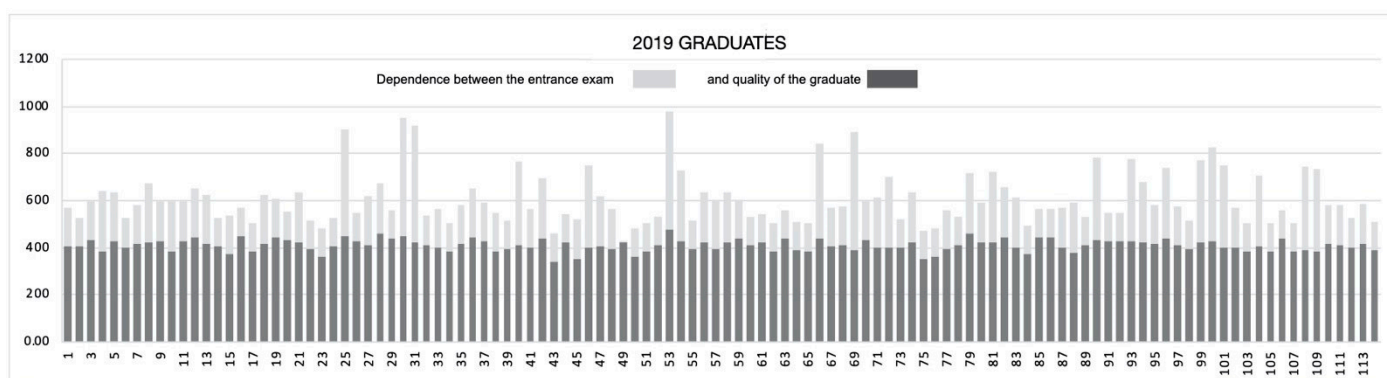


Figure 4. The ranking of 2019 BSc (Engineer) programme graduates vs. their position on the admission list (result of entrance exams in drawing).

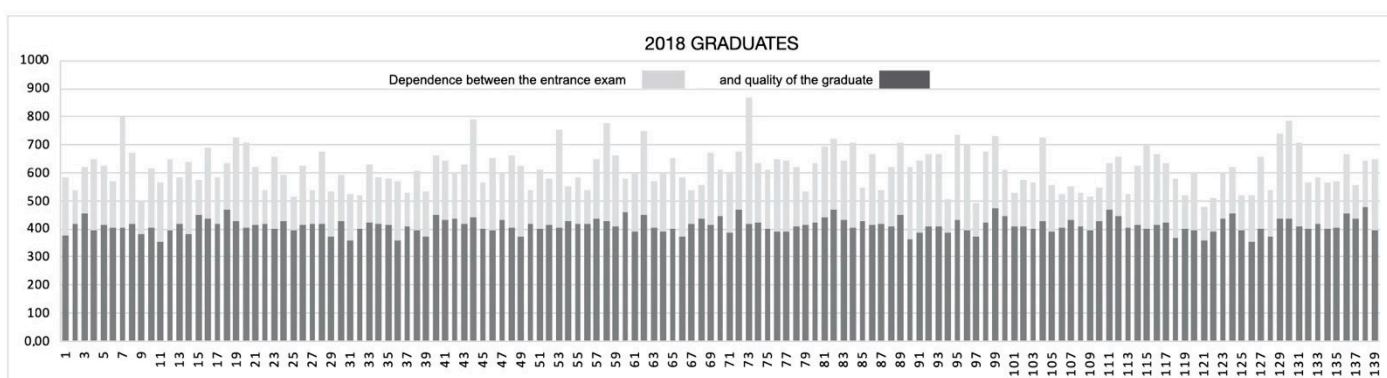


Figure 5. The ranking of 2018 BSc (Engineer) programme graduates vs. their position on the admission list (result of entrance exams in drawing).

3. Results

Having completed the first analysis of the correlation between the learning outcomes of graduates and the quality of the candidate, it has been found that the correlation between the top results of the entrance exam (M + R) in the field of architecture and the overall study grades upon their completion was moderate. Moreover, the correlation was the lowest when the learning outcomes of graduates was compared to the results of the drawing stage of the entrance exam. The mean coefficient of the Spearman Rank Correlation was $r = \text{below } 0.03$ (i.e., $R = 0.01$ for the 2018 graduates, 0.27 for the 2019 graduates and $r = 0.09$ for the 2020 graduates).

for the 2020 graduates); thus, the correlation between the 2018 and 2020 graduates was low and that with the 2019 graduates was poor. The analysis of the results confirms that the verification of the drawing skills at the recruitment stage does not translate into a high score at the completion of the first cycle of architectural (engineer) studies.

An inverse relationship was found as regards the correlation between quality of the candidate measured with the results of the secondary school leaving exams (M) at the entrance exam, and the graduate performance. Here, the correlation is high. The mean coefficient of the Spearman Rank Correlation was over 0.4 (0.47 for the 2018 graduates, 0.46 for the 2019 graduates). Only in the case of the 2020 graduates was the coefficient a bit lower, 0.26 (low correlation, i.e., correlation present)

This shows that the results of the secondary school leaving exams (M) scored by candidates for architectural studies are much more important, as regards their contribution to the quality of the graduates, than the results scored by them in the drawing exam. This means that drawing skills verified in the recruitment process do not determine the quality of graduates of master engineer studies in the field of architecture.

The second analysis was intended to find the correlation between the results scored at the entrance exam (drawing stage) and the grades scored by the students in respective semesters of studies in artistic subjects, i.e., Drawing 1, Drawing 2, Drawing 3 and Drawing 4. Such present correlation was found only as regards the students' performance in the first two semesters of studies. The mean coefficient of the Spearman Rank Correlation was $r = 0.3$ after the first semester.

In subsequent semesters, i.e., Drawing 3 and Drawing 4, the results obtained in the entrance exam (the drawing stage) failed to be reflected in the learning outcomes and grades scored in artistic subjects. The mean coefficient of the Spearman Rank Correlation was $r = 0.11$ for the last two semesters of the drawing instruction.

This shows that there is no correlation between the results obtained in the entrance exam (the drawing stage) and the grades obtained by the students in the Drawing classes during their education in subsequent semesters of studies (this concerns the artistic subjects: Drawing 1, Drawing 2, Drawing 3 and Drawing 4).

At the same time, these findings enable us to state that drawing skills can be effectively improved in the process of architectural education. The studies also show that the results of drawing exams have a significant impact on the ranking of university candidates. If, for some reason, the 2020, 2019 and 2018 graduates had not been required to pass an exam in drawing and had been admitted merely based on their grades scored in secondary school leaving exams, then some 30% of the candidates would not have been admitted at all, after being ranked below the admission limit. Instead, those candidates with better grades in secondary school leaving exams and worse drawing skills would have been admitted. The impact of the admission requirements and the entrance exam in drawing on the quality of the students of architectural studies is assessed to be 1/3.

4. Discussion

The organisation of the drawing exam is a logistics challenge because the number of candidates for architectural studies is constantly increasing.

Assessment of the drawing skills is important in view of the fact that it is closely correlated with other skills of the students, e.g., writing skills. Students who show better drawing skills usually do better in textual exercises [9].

Having analysed the obtained results, in particular the dependencies between the results of the entrance exam (drawing stage) and the learning outcomes scored at the first cycle programme of the architectural studies (quality of the graduate), it has been concluded that the drawing skills that the candidates have before the commencement of architectural education are only of secondary importance for their overall learning outcomes in the entire period of studies. It may be further concluded that the high qualifications of the academics and the high quality of the architectural education programme guarantee top learning outcomes in artistic subjects. Thus, students that did not do so well at their entrance exam

in drawing and ranked low at the admission list can easily make up for their poor drawing skills and graduate from studies with a high overall study grades, anyway.

In Poland, the recruitment procedure for architectural studies in the majority of universities includes a mandatory drawing exam organised in a stationary form to verify the drawing skills of the candidates. The research conducted by the authors is of a pioneering nature and the results thereof lead us to conclude that the criteria applicable during the recruitment procedure at architectural studies fail to be based on justified grounds. Therefore, it seems fully justified to continue to research this issue further by extending the sample group with graduates that completed their studies earlier than the group researched herein in order to form a relevant standing in view of the requirements of the recruitment procedure.

The presented studies attempt to assess the impact of the recruitment procedure on the quality of graduates from architectural study programmes taught at state-run universities in Poland, and to compare the situation in Poland with the learning outcomes of graduates of renowned European universities, e.g., the University of Technology in Milan, where the recruitment procedure does not include any verification of the drawing skills of the candidates.

As other researchers claim [12–14], a higher admission point threshold and stringent admission criteria do not always signify the efficiency of the education process itself and may often limit access to architectural studies. One should also note that, currently, the recruitment procedures used in renowned European university centres offering architectural education differ. To study architecture in the UK, a candidate is supposed to submit a letter of motivation, references and a portfolio and go through an interview. Recruitment is often carried out in several stages. The number of works in a portfolio and their topics often differ from university to university. Basically, there is no examination in drawing; the evaluation basis is the portfolio, and the entire recruitment process may be completed online. The portfolio is quite extensive, often containing 20–30 drawings that are presented electronically (as pdf or jpeg files). This makes British universities definitely more accessible than Polish ones. In Italy, universities such as Politecnico di Milano or Rome University do not verify drawing skills but require candidates to pass an examination checking general knowledge in such areas as history, art, mathematics and physics. In Germany, the situation is different: a portfolio is mandatory, just as it is in Holland and France. When we look at Polish conditions, on one hand, they are more uniform but, on the other, they are also stricter, as personal presence at the exam is required and online submission is not permitted. This is definitely another element that prevents Polish universities to open up to foreign students.

On the basis of the results presented herein, the Faculty of Architecture, Poznan University of Technology, decided to exclude the drawing exam from the recruitment criteria. The 2020/21 recruitment procedure was solely based on the grades the candidates scored in their secondary school exit exams. Deviation from the previously adopted form of the drawing exam for candidates for architectural studies directly stemmed from the situation of a global pandemic, which prevented the organisation of the exam in the previously applied stationary form. Nevertheless, as indicated above, this shall not entail a lower quality of the graduates of architectural studies in Poland, nor shall it be reflected directly in the performance of the students in the artistic subjects.

At the same time, it shall only confirm the justified grounds for the recruitment criteria that apply in many other European universities in reference to admission to architectural studies, which do not verify in any way the drawing skills of candidates because they can acquire such skills in the process of their architectural education. Instead of a drawing exam, many of the European universities include a presentation of a portfolio of works and deem it an adequate and sufficient recruitment criterion. The next planned step is to supplement this research by evaluating the careers of architecture graduates in Poland and correlating their professional position after studies with their skills at the beginning and end of their studies. Such research will offer a greater understanding of the role of

architectural drawing in architectural education in Poland, as a wider practical context will be taken into consideration, i.e., the professional aspect.

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