The impact of municipal planning institutions on the quality of Master's thesis in terms of urban design

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ABSTRACT: Introducing students to the subject of urban planning and design is a long-term process that requires a broad integration of multiple institutions. To achieve this, the Chair of Urbanism and City Structure Architecture in the Faculty of Architecture at Cracow University of Technology (FA-CUT), Kraków, Poland, engages in co-operation with planning institutions of major Polish cities with the intent to confront students with key dilemmas of contemporary urban development. In this article, is presented an educational method based on co-operation with the Municipal Urban Planning Studio (MUPS) from Łódź, Poland, with the application of parametric techniques. A Master's thesis project was based on the proposed three-stage method and enabled an in-depth evaluation of assumptions and design solutions, and their continuous modelling relative to contemporary municipal policy. This method can enhance future graduates' knowledge and skills in co-operation with planning institutions and the application of additional analytical tools in investigating the urban consequences of decisions.

INTRODUCTION

The comprehensiveness and dynamism of the transformation of the contemporary city requires adequate measures to be undertaken in the education process. Polish cities, just like many others within Central and Eastern Europe, are still going through processes that stem from the region's post-1989 political transformation. They are also affected by problems faced by most contemporary cities. In the educational process, it is essential to identify those cities that provide clear examples of these changes.

For this reason, the Chair of Urbanism and City Structure Architecture in the Faculty of Architecture at Cracow University of Technology (FA-CUT), Kraków, Poland, engages in co-operation with cities of varying size and affected by different problems, which reflect leading global issues. One interesting example of a Polish city, that is a globally known research subject, is Łódź in Poland. The problem of its shrinkage [1] and adaptation to climate change [2] can be a highly inspiring case for research and education, particularly for Master's thesis projects in the field of architecture and urban design.

The objective of this article is to present an educational method based on co-operation with a municipal planning institution that allows students to confront challenging problems and identify leading trends in global urban planning. The application of parametric techniques that enable necessary simulations of urban models is an essential aspect of implementing this method. The method has been presented on the basis of a design for the city of Łódź, prepared in co-operation with the Municipal Urban Planning Studio (MUPS).

BACKGROUND OF THE METHOD

Contemporary architectural and urban design-focused education is increasingly based on various types of co-operation with external entities. Bringing the process of education as close to the conditions of the actual world of design is replete with numerous forms of co-operation and activity. Particularly, competitions that integrate teachers and students [3] and co-operation with municipalities [4] allow graduates to significantly enhance their skills and knowledge.

When looking at the complexity of educational offerings for future architects, it is key to select a proper subject, which shall be the basis for conducting research. It should be mentioned that the selection of a specific city, which in itself is a type of testing ground for the challenges of contemporary urban planning, is the most essential aspect. The decision to engage with a subject located in Łódź is aligned with the academic research by the Chair's staff that focuses on the city. This research has confirmed Łódź's global exceptionality as a city that struggles against shrinkage processes [5][6]. The clarity and distinctiveness of the urban issues under study enabled a more effective direction and development of the Master's thesis project.

TEACHING METHOD: THREE STAGES

The teaching method, via its clear stage-based structure, aids in the systematisation of external institution participation in the entirety of the teaching process (see Table 1). The idea of teaching in co-operation with an external institution is, in this case, based on a balanced participation of each party. Parametric modelling is an essential part of the method, enabling scenario simulations and the preparation of urban models that conform to municipal policy requirements.

Table 1: Participation of external institutions in the three stages of the design process.

	Stage I (analysis)	Stage II (parametric modelling)	Stage III (design)
External institution (MUPS)	high	medium	low
Student	low	medium	high

The models, produced via parametric simulations, are to aid in selecting proper spatio-functional structures, which in the case presented implements a smart shrinkage scenario as an optimistic alternative of Łódź's development [6]. The three stages of working on the project form a consistent whole and enable the evaluation of each stage:

- Stage I: urban analysis: on-site studies and city mapping;
- Stage II: parametric urban model simulation;
- Stage III: urban design and urban model evaluation.

The method presented above was tested during work on a Master's thesis project prepared in the Department of Urbanism and City Structure Architecture in the FA-CUT, entitled *Ogrody Sukiennicze (Cloth Hall Gardens)*, revitalisation of a fragment of Łódź's city centre with the application of parametric techniques (Author: K. Łoziński; Supervisor: K. Racoń-Leja; and Co-supervisor: A. Matusik).

The method presented places great emphasis on supporting the future graduate's independence throughout the entire design process. The first two stages have more of a supportive character, while the third stage is dominated by the student's original input, and is an interpretation of reality under study.

Stage I - Urban Analysis

Educational measures performed during the first stage of working on the project are largely dominated by the participation of external institutions. In the case under analysis, this was the main input of the Municipal Urban Planning Studio in Łódź, based on current municipal policy trajectories [7]. Here, choosing Łódź allowed the student to tackle key current urban dilemmas that affect cities in Poland and around the world. This choice was obvious due to the progressive shrinkage of Łódź [1], as well as the measures taken by the municipality to slow down this process by enhancing competitiveness: improving the quality of public space and its functional offering, as well as countering climate change. As part of the first stage, a study trip was organised to familiarise students with the city's structure and its spatial policy. The following was included in the trip's itinerary:

- Meetings with MUPS representatives at the project site;
- Students' familiarisation with the primary indications of municipal policy;
- Identifying the target project site by the MUPS as part of the currently ongoing revitalisation measures;
- Having the students perform urban analyses on-site, along with social interviews.

The stage culminated in an analysis of the city's urban layers, accounting for the information obtained during a site visit (Figure 1).

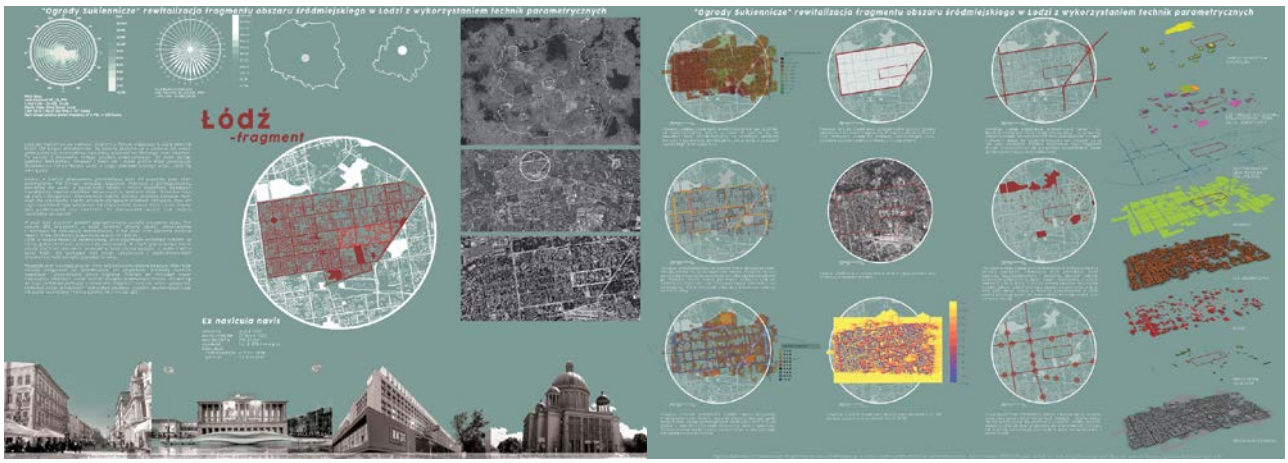

Figure 1: Stage I - urban analysis with the participation of MUPS.

Physically experiencing urban space in the area covered by the design together with its buffer zone is the most important teaching element at this stage. Confronting one's mental image of an area with its actual specificity is particularly valuable to future architects. Here, the participation of external institutions in the creation of urban fabric, particularly the associated social subject matter, is key. The previously mentioned confrontation, both with representatives of planning institutions and the local community, appears to be a necessary condition in the following process of teaching and work on the design [8]. The definition of problem groups and identifying fundamental threats and potentials stemming from the introduction of a new mixed-use structure in the cityscape is subjected to an evaluation during the next stage, which is crucial to the entire design process.

Stage II - Parametric Simulations of Urban Models

Stage II assumes preparing a key element for the entire teaching process, based on co-operation with a municipal planning institution. It is the creation of urban models that simulate varied traffic loads on the project site depending on the parameters adopted (Figure 2). Three models were prepared as part of the studies engaged in by the student:

- Extensive model (assumes the lowest function density percentage and an average individual vehicular traffic load);
- Intensive model (assumes the highest function density percentage and the highest individual vehicular traffic load);
- Optimal model (assumes a balanced function density, limited individual vehicular traffic and the highest biologically active surface indicator).

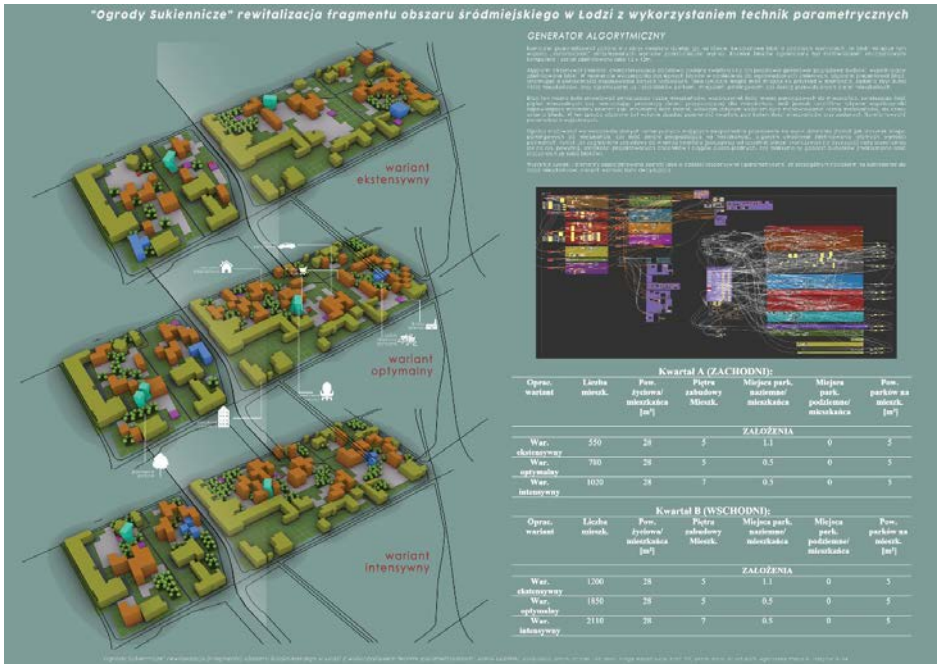

Figure 2: Stage II - urban model simulation based on MUPS guidelines.

At this stage, it is essential to evaluate each model by an assessment team comprising representatives from the municipal planning institution, teachers and the diploma candidate. The evaluation is based on numerical data generated for the models, which allow an assessment of the future intervention into the city's urban structure. The data obtained using parametric techniques enabled the analyses of expected impacts of loads introduced into the structure of blocks A and B under design (indicated by the MUPS) as part of three urban models.

Table 2: Urban model parametric analysis for the area under design.

Urban model	Number of residents	Residential area per capita [m^2]	Number of residential storeys	Surface parking spots per capita	Underground parking spots per capita	Park area per capita [m^2]
Block A - assumptions						
Extensive	550	28	5	1.1	0	5
Optimal	780	28	5	0.5	0	5
Intensive	1,020	28	7	0.5	0	5
Block B - assumptions						
Extensive	1,200	28	5	1.1	0	5
Optimal	1,850	28	5	0.5	0	5
Intensive	2,110	28	7	0.5	0	5

Stage III - Model Interpretation and Urban Tool Selection

Stage III of working on the project with the co-operation of the external institution is characterised by the greatest level of independence and the dominant contribution of the student, the designer. Its essence is to interpret the adopted model, and then apply proper solutions and urban design tools.

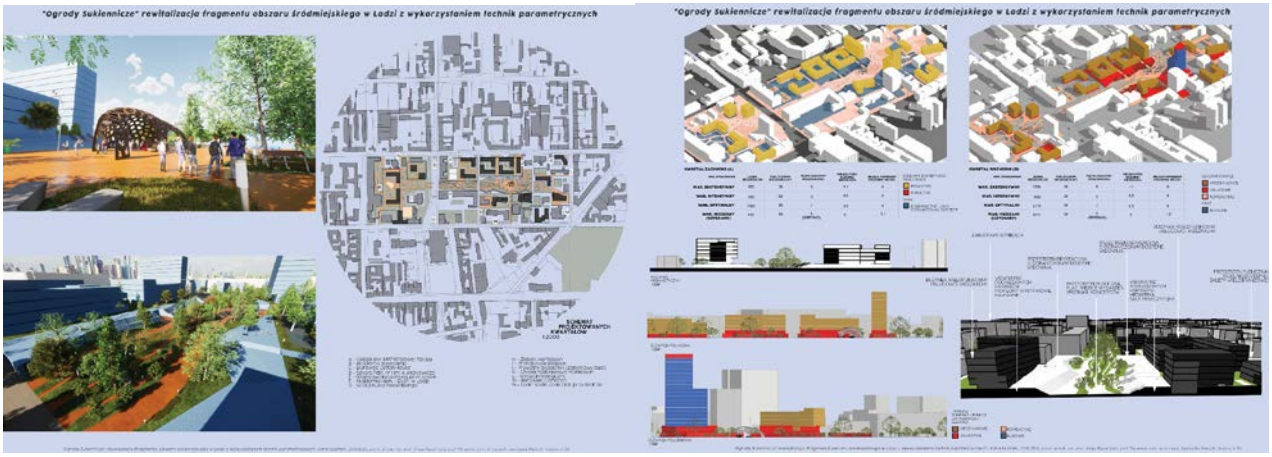

Figure 3: Stage III - interpretation and selection of urban design tools.

The adopted model is evaluated using a parametric technique, enabling a comparison of the outcomes achieved in the simulation phase (see Table 3).

Table 3. Dependence between the city's layers and their accessibility, continuity and identification.

	Structural layer	Functional layer	Social layer
Accessibility	Opening up blocks to pedestrian and bicycle circulation	Opening the interior of the block to a new typology of public buildings	An egalitarian space, easily accessible to all social groups
Continuity	Countering urban fragmentation - introducing new urban tissue	Supplementing the urban system of public spaces with new functions in a low-density area yet with high-potential surroundings	Countering social island emergence - introducing continuity in terms of social use
Identification	New urban fabric and public space typology	New public building (filter) typology at the edge of blocks and streets, close links with public space	A new informal urban forum

The new urban structure and its functional programme are to answer problems defined in overarching municipal policy documents, such as the 2019 resolutions of the Łódź City Council [7]. Here, the key aspect is to propose a new typology of public space that can become the main attractor of the area under study. High-quality urban space can become a factor that influences the quality of the urban structure in a revitalised area [9]. At this stage, the student acts on three planes of urban space, tackling problems of accessibility, continuity and identification (see Table 1).

- Structural plane;
- Functional plane;
- Social plane.

The new urban design for blocks A and B proposed by the external institution that was to tackle the aspects of accessibility, continuity and identification as part of the layers presented above, was subjected to evaluation in reference to the proposed parametric models in the final stage. The reuse of parametric techniques to test the model enables to measurably evaluate the potential and risk generated by the new urban structure (see Table 4).

Table 4: Parametric listing of the urban model developed for the area under design.

Urban model	Number of residents	Residential area per capita [m^2]	Number of residential storeys	Surface parking spots per capita	Underground parking spots per capita	Park area per capita [m^2]
Block A - assumptions						
Mixed (obtained)	610	28	6 (on average)	0	1.1	16.83

Block B - assumptions						
Mixed (obtained)	1212	28	5 (on average)	0.16 (service parking spots)	1.2	10.95

Tendencies that currently predominate within urbanist discourse and that are reflected in the spatial policy of the city which became the focus of the teaching process, are an essential aspect.

DISCUSSION

The transformation of Polish cities that has taken place as a result of political transformations has forced both the institutions that design them and future architects to find a new way of tackling the subject matter of urban planning. Enabling co-operation between planning institutions and universities results in the latter having to re-evaluate their educational techniques and to choose their design assignments with greater diligence [10].

This is becoming increasingly more reflected in the subjects taken up as a result of major problems in urban planning. The most crucial of these include progressive city shrinkage [1], particularly affecting cities of Central and Eastern Europe [11], and increasingly severe climate change [12]. Thus, training future graduates in the philosophy of controlling negative tendencies and applying development formulae to tackle them, in the form of smart shrinkage and climate change adaptation measures, shall be key to the teaching process.

IMPLICATIONS FOR ENGINEERING EDUCATION

The objective of the presented urban design that was prepared as part of a Master's thesis project was to test an educational formula based on integrating theoretical knowledge with practical mechanisms. Due to its multi-layered character, this formula is a hybrid form, based on bipolar evaluation - both from an academic level and that of planning practice. The design task, which was a teaching experiment, has applicative value (see Table 5).

Table 5: Didactic component in education processes.

Teaching process component parameters	Teaching objective	Practical experience	Educational outcome
Analytical understanding of the planning process	Developing the ability to analyse data obtained at the theoretical and practical level	The student comes into contact with various analytical forms; the student develops flexibility and multi-aspect understanding of data; the student participates in a dynamic process of projecting and understanding data obtained	The student is to master the ability to draw conclusions from theoretical and practical materials, and establish assumption hierarchies based on the theoretical and practical knowledge gained
Tools for investigating urban processes	Identification, selection and implementation of available tools that are adequate to the task	Implementation of the tool and determining critical phases as part of theoretical assumptions and indications from practical experiences of the city subjected to experimentation	The student masters the implementation of data obtained by the urban planning tool
Coordination of design work in an urban design	Familiarising the student with the diversity of planning measures and preparing their alternatives at the level of potential enhancement and risk limitation	Adopting the correct staging/alternative preparation for the urban design, accounting for temporal phases and changing scenarios	The student gains the ability to optimise assumptions and applicative value of the design

CONCLUSIONS

In the author's opinion, incorporating planning institutions into the teaching process considerably expands the spectrum of analytical and design activities that a future graduate architect must face. The possibility of evaluating every stage of one's work appears particularly beneficial. Linking the method with parametric techniques can be seen as a major asset of the method presented. However, parametric models themselves are not equivalent to the physical shape of the structure that is being designed.

The ability of the future graduate-architect to interpret the existing context - in its structural, functional, ecological and socio-cultural scope, remains most essential. Parametric verification is, in this respect, a useful tool that must also be skilfully interpreted. Co-operation in this field with representatives of external institutions allows the proper framing of these interpretations in design reality, as well as to enhance student skills in presenting arguments in favour of the proposal and defending their assumptions.

The presented educational experience that covers an interdisciplinary urban design can be used to define fundamental benefits. These include the ability to dynamically react to changes in both starting and analysis-based data, in addition to flexibility and the ability to formulate final conclusions. Hybrid integration, which combines the theoretical plane (academic) and practical (external planning institutions) provides the broadest spectrum of knowledge in terms of training the ability to optimise design decisions.

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