

Urban transport: developing a teaching format in architectural and urban design

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ABSTRACT: In this article, the author discusses the formulation of teaching formats for urban transport in architectural education. In previous years, the urban transport module was taught with the use of different teaching methodologies and was offered to Bachelor and Master students of an architecture and urban design course at a university in Poland. The module's content does not have an in-built teaching formula for architecture and urban design students, and it requires the development of an individual methodological direction and instructor-based team coordination. The module's programme has developed gradually and evolved from a separated format into an integrated one. The previous model involved individual exercise classes that dealt with different urban and architectural scales. The subsequent development of the whole architecture curriculum forced transport issues to be integrated with the urban design module. The presented comparison between the methodology based on separate exercises and the cohesive model showcases the optimised curriculum. The evaluation results contribute to the discussion on the optimal methods of teaching in architectural schools.

INTRODUCTION

Architectural education in relation to urban transport is tightly connected with a changing perspective on transport issues in the city. The impact of Modernism and functionalism on urbanisation should be continually discussed when teaching engineers and architects. The excessive rise in significance of individual transport, in spite of the original assumptions of Modernists, has become a major element of forming post-war urban layouts. A revision of approaches to shaping urban layouts and transport is currently becoming a basis for implementing the idea of sustainable development. Mobility is an essential element of shaping contemporary models of public life [1].

The experience of the Covid-19 pandemic leads towards a temporary or permanent transformation of transport spaces into public spaces, including green spaces. The housing environment in a pandemic-era city is a space that is friendly to pedestrians and cyclists, in which walkability is an important quality assessment factor [2]. Even large European cities like Milan or Paris intend to transform their centres into 15-minute cities, where short walkable distances provide residents with access to essential services and public spaces, as well as open recreational and green spaces [3]. These principles are also compliant with a transit-oriented development (TOD).

The objective of this article is to compare three education formats of teaching the urban transport module as part of the Architecture and Urban Planning course in the Faculty of Architecture at Cracow University of Technology (FA-CUT), Kraków, Poland. The outline and discussion presented here cover the past several years, when these models have been significantly modified. Classes were taught interchangeably during first- and second-cycle studies, either in an independent format or in integration with a design studio module. The educational changes were an attempt at adapting the curriculum to the guidelines set forth by the accreditation team of the Royal Institute of British Architects (RIBA) after a visit in 2017. They also reflect curricular adaptations to the legal regulations on architectural education in Poland that have been in force since 2019 [4][5].

Contemporary trends lead to an integration of transport with architectural and urban design studio modules [6]. Architectural and urban design education should unite the design process with participation, including the impact of community consultation and local mediation [7]. Inclusive approaches are especially effective in the context of complex urban developments, allowing for a multi-aspect and diverse approach, encompassing student groups [8]. Likewise, teaching urban transport follows a multi-disciplinary and practice-based trajectory [9]. In many cases, the joint teaching of mobility-related content including traffic calming that stresses mass transport, pedestrian and bicycle traffic, can lead to the development of an informed design process. There is a growing need to search for innovation in urban transport [10][11]. In urban design assignments, the integration of larger street cross-sections, including expressways and local roads, aimed at improving public space quality and their informed remodelling can be an element that supports design in high-density areas both on a micro- and macro-scale [12][13].

TEACHING METHODOLOGY

Theoretical Base

Lectures that accompany the module focus on a range of problems concerning transport and circulation in the context of architecture and urban design. More specifically, they cover: road hierarchy and road current classification; street network composition; parking in the city; fire department access roads; and the relevant legal documents [14]. The lectures are also intended to acquaint students with contemporary trends in constraining vehicular traffic in urbanised areas and to discuss environmental conditions in relation to transport modes as part of sustainable transport. This subject matter includes: vehicular traffic in the city; impact of the automobile on urban fabric; classification of street layouts, pedestrian traffic; presence of persons with special needs in public spaces; and bicycle traffic in the city.

On the example of European cities, ranging from historical to contemporary times, the lectures illustrate the significance and permanence of road layouts in city composition, as well as the impact of orthogonal layouts and the *Jefferson Grid* on the development of American urban designs. In reference to transport, the lectures present concepts of ideal cities and ideas propagated by New Urbanism. Separate discussions are dedicated to exurbanisation and methods of countering its negative aspects in relation to transport solutions. A significant part of the presentation includes a general overview of means of mass transport in the city, such as the tram, high-speed tram, bus, bus rapid transit, commuter rail, underground rail/subway, monorail or water-based transport. The lectures are complemented by presentations in the form of short seminars that accompany classes. They are an element that supplements theoretical knowledge with specific legal requirements and are adapted accordingly to specific regulations applicable in Poland at the time.

Practical Part

The changes to teaching the urban transport module in the Faculty of Architecture that were proposed in recent years concern practical aspects of teaching, its thematic scopes and the scopes' alignment with the design process as part of *integrated design*. In the practical part, exercises comprised of in-class drawing-based tests, design studio classes in the form of consultations and seminars. The differences in class organisation are presented in Table 1.

Table 1: Teaching formats - organisational aspects.

Teaching format	Format 1.1	Format 1.2	Format 2.0
Period of implementation	2015/16-2017/18	Since 2018/19	2015/16, 2016/17
Cycle	First cycle	First cycle	Second cycle
Semester	5th	5th/6th	3rd (final)
Form of the class	15 hours of lectures and 15 hours of exercises	15 hours of lectures and 15 hours of design studio classes	15 hours of lectures and 15 hours of seminars
Group size	24	12	30
Feasibility of group work	No	Yes	Yes
Thematic link of exercises with design assignments	Three problem-focused exercises and one integrated exercise	Full integration with design assignments	Sample theoretical problems
Organisational link between the urban transport module and the design studio module	Classes spread into four blocks, independently of design studio classes	Classes taught in parallel in the same classrooms or immediately after	Classes taught independently of the design studio module
Final grade	Averaged grade based on exercises	Individualised grade, linked with design studio module grade	Assignment-based grade

Teaching Format 1.1

The module was taught independently of the design studio module. The exercises were based on in-class drawing tests supervised by module staff. The exercises differed in terms of scales the students worked with, gradually leading to solving complex design problems associated with transport and circulation. They included:

- Exercise 01, scale 1:5000 - students were to design a clear transport and circulation layout for a fragment of a district on a previously prepared urban plan showing existing development in the form of a figure-ground plan (also called a Nolli plan), taking into account the principles of street hierarchy, land use boundaries, intersection placement and highlighting identifiable and distinctive urban units, while retaining green and public areas;
- Exercise 02, scale 1:2000 - students were to design a transport and circulation scheme for a housing complex (on a previously prepared plan) taking into account urban composition, spatial context, including the surrounding layout of streets, public and green spaces, adaptation to the cardinal directions and an even distribution of parking spaces;
- Exercise 03, scale 1:500 - students were to prepare a site plan (for a given site) that would accommodate the transport and circulation scheme of a complex of housing buildings following the principles of architectural

design and including fire department access roads. The scale of the exercise was an essential design scale, which is why adherence to architectural and technical regulations was stressed; the exercise was to include dimensions and proportions of pedestrian and bicycle traffic solutions, a transport and circulation scheme, including parking spots and fire department access roads;

- Exercise 04, scale 1:200 - sectional perspective drawing of a street adjacent to a housing or service building designed on a specific site as part of an architectural design studio module. The perspective drawing was to accommodate student-proposed traffic calming elements, with the intention to enhance public spaces in terms of pedestrian and bicycle traffic. This exercise was integrated with the design studio assignment.

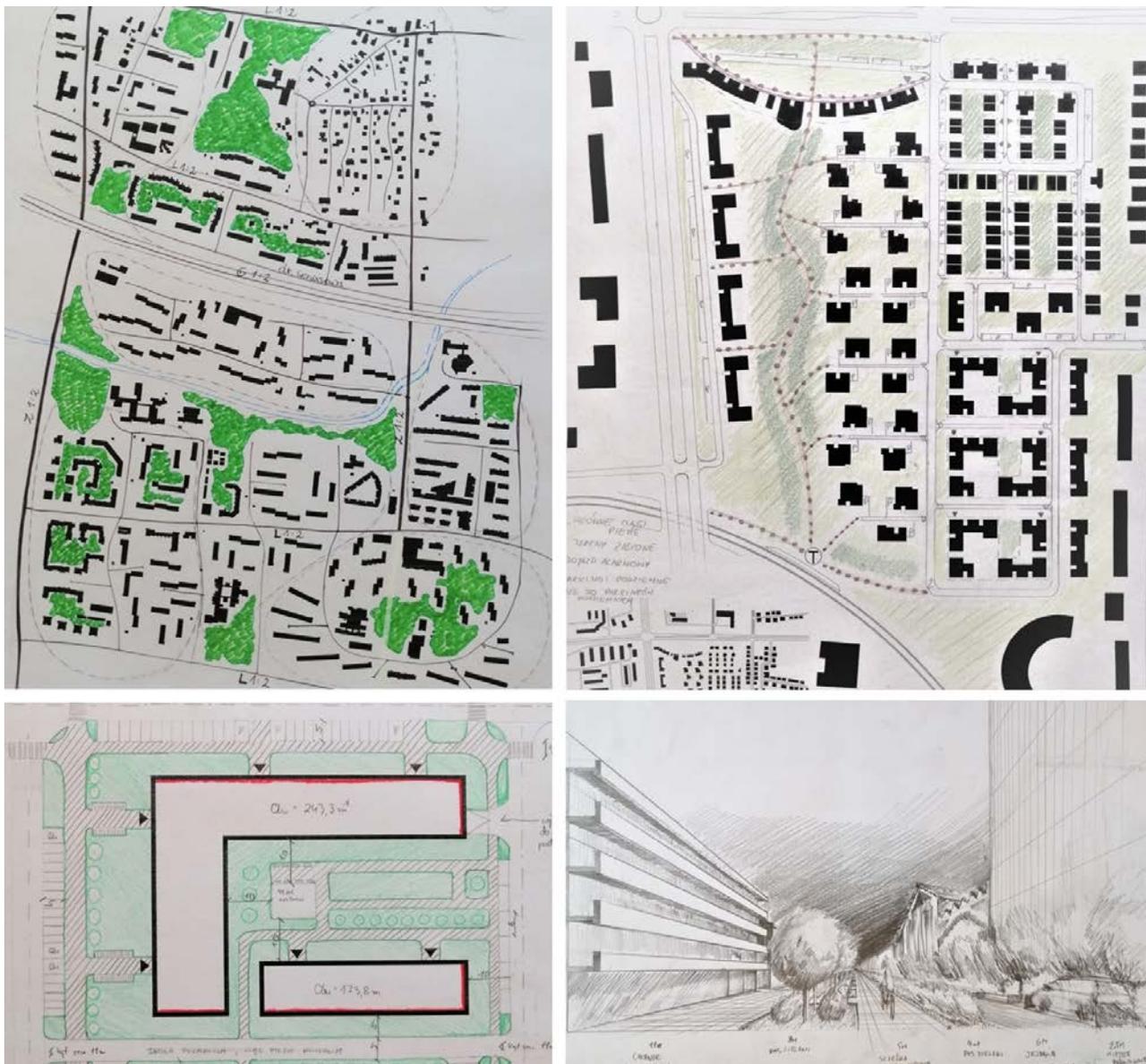


Figure 1: Exercise assignments for teaching format 1.1: top, from left to right - exercise 01, 02, bottom, from left to right - 03 and 04; students: D. Szostecka, P. Karlik, D. Czyżowski and M. Krupa.

Teaching Format 1.2

The Faculty's evaluation by the RIBA during a validation visit became an impulse to integrate modules as part of implementing integrated design. As a result of the Teaching Commission's proceedings, it was decided to integrate the urban transport module with the urban design studio module. From the perspective of module staff, this meant a complete rearrangement of the teaching format. All of its thematic and temporal elements were adapted to fit the design studio assignment, and considered:

- Urban analysis - prepared by students in groups, a series of analyses concerning vehicular traffic, building frontage composition, parking space accessibility, mass, rapid and regular transport, pedestrian and bicycle paths, and other elements of the transport and circulation scheme relevant to the assignment's topic.
- Conceptual urban design proposal, 1:2000 - prepared individually or in groups, vehicular transport solutions in terms of access and parking spaces, mass transport including approach zones to stops, and pedestrian and bicycle traffic continuity. Relevant schemes were also supposed to be added to transport and circulation-related scopes.

- Floor plan, 1:500 - plan and cross-section drawings presenting transport solutions around buildings, including detailed transport and circulation schemes, parameters for pedestrian and bicycle paths, and parking spaces for cars and bicycles.
- Urban design detail, 1:200 - presented in the form of plans and cross-sections displaying traffic calming elements on two selected streets, each of a different class. Street remodelling as an adaptation to pedestrian and bicycle traffic was taught on the basis of analogous case studies prepared individually by each student.



Figure 1: Exercise assignments for teaching format 1.2: integrated design - urban transport as an integrated module with the urban design studio - it included, among others, elements of analyses, a design drawn to a scale of 1:2000 and design solutions for street and pedestrian path cross-sections. Students: S. Chudzik, C. Kuźma, D. Madej and D. Warło.

Teaching Format 2.0

This curriculum was prepared for second-cycle students, intended as a module that would allow students whose first-cycle curriculum had not included urban transport. The urban transport module was reassigned from first-cycle studies as a result of an error in curriculum design for this group. The seminar-based character of the classes practically meant that students had to prepare presentations on selected aspects of the module's subject matter. Their assignments concerned, among others, calming traffic, including shared streets in housing complexes, woonerfs/living streets and their significance as public spaces. They presented pedestrian and bicycle circulation solutions in the city. They accommodated modern mass transport systems in urbanised areas and TOD-based proposals. The presentations were accompanied by a collective discussion, with an aim to demonstrate the impact of transport solutions on the social, built and natural environments.

EVALUATION AND CONCLUSIONS

The methods outlined in this article have been evaluated by the author. Considering the small team of instructors available, it was necessary to assess the workload placed on academic teachers and the character of their work (Table 2). A detailed comparison of the impact of each method on student education quality was also performed (Table 3).

Table 2: Instructor workload and work character evaluation.

Teaching format	Format 1.1	Format 1.2	Format 2.0
Assignments	Identical exercise assignments	Diverse subject matter - varied assignments	Diverse theoretical subject matter

Instructor workload	Considerable, including outside-of-class hours	Considerable, but confined to consultations during class hours	Regular
Instructor motivation	Poor	Considerable, visible engagement	Average
Other remarks	The working off of missed classes by students generates considerable additional contact hours	High flexibility in terms of assignments and class organisation	The module should be taught during earlier semesters

Table 3: Student performance evaluation.

Teaching format	Format 1.1	Format 1.2	Format 2.0
Significance of group work in the assignment	-	Motivation, visible enhancement of subject matter	No notable significance
Student engagement	Average	Higher than average	Average
Use of assignment in design work	Average	Considerable	Average yet motivating
Instructor-student contact	General consultation	Individual consultation	Individual remarks

The comparative analysis presented above allowed for the formulation of final conclusions. The first set concerns teaching staff. Teaching the urban transport module requires high qualifications from instructors, both in terms of architectural and urban design, and of specific aspects of traffic engineering.

In terms of the teaching formats analysed, format 1.1 appears to result in an excessive workload. In many ways, it disorganised the work of the entire instructor team - due to the number of supplementary classes in the form of drawing tests the students had to take.

Format 1.2 was found to require considerable flexibility from instructors and demanded they adapt to the subject matter and individual schedule of a given design studio group. The limited number of contact hours per student was also found to be problematic, despite the group being twice as small as in the case of format 1.1.

Format 2.0 can be taught by educators who specialise in theory, have considerable knowledge of the literature and of cases of contemporary urban transport and circulation solutions.

The teaching outcomes observed among students for each teaching format can be summarised as follows. Format 1.1 was found to be in line with the previous version of the module's teaching, stressing the engineering character of the classes, where abstract models of action were tested. According to the module's assumptions, student workload was confined largely to the classes themselves; hence, the form of a drawing-based test. Despite considerable efforts by instructors to prepare interesting and cross-sectional assignment subjects, they were not directly connected to essential design assignments worked on during the given semester. The exception here was the final exercise focused on preparing a sectional perspective drawing of a street in the context of one's newly-designed architecture.

The observations and conclusions formulated during heated discussions that took place during the Teaching Commission's proceedings at the Faculty of Architecture indicated that the module's outcomes did not necessarily carry over to other modules. Students were not able to properly use the knowledge taught within the urban transport module and inadequately applied it in their design assignments. The classes seemed to enhance the students' skill set, but the high interdisciplinarity and lack of connection to other areas of design adversely affected the permanence of their effects.

Format 1.2, introduced at the time of this article's writing has allowed for a complementary connection of the urban transport module with the urban design studio module, both thematically and organisationally. The classes are taught in the same rooms or in contact with the instructor who also supervises the primary design studio module assignment, which allows for an extension of the discussion on the subject. The adaptation of the modules has also enabled conducting some of the tasks in groups, which affects the quality of solutions and forces students to make more informed choices [15]. Likewise, in the case of assignments supervised in conjunction with a local government, a greater amount of actual transport and circulatory conditions can be taken into account [16]. The instructors have also noted greater student engagement in the module. Interesting transport and circulation solutions are an essential element of design solutions, leading to a notable improvement of design projects. The informed application of traffic calming elements was found to enhance the potential to design attractive public and green spaces that can form an essential element of a newly-designed complex. This matter takes on a special significance in compact downtown areas [17].

Format 2.0, as a transition phase, was not found to have a significant impact on enhancing engineering qualifications, largely because most students had already obtained them earlier. However, its significance consists in inspiring and enhancing the spectrum of possible design solutions concerning transport and circulation. Thesis projects from the period under study displayed a greater than average share of interesting and innovative pedestrian and bicycle path solutions, in addition to the elimination of circulatory barriers. One of the positive consequences of introducing this

format during the final semester was the provision of continuous consultation offers on transport and circulation for thesis designs. At present, these consultations primarily concern urban design solutions.

Discussions on the teaching of engineers, architects and urbanists that have been ongoing in recent years often refer to combining classes and module integration to enhance the context of design. Among the presented formats, format 1.2 was found to have the most promising outcomes, precisely due to being the only one of the analysed formats to be fully integrated with the urban design studio module. Its promising results demonstrate that inclusiveness understood, as combining various aspects of design in the teaching process, is an essential part of introducing students to professional work.

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