Housing environment in teaching architecture and spatial management students - methodology and effects

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ABSTRACT: Shaping the housing environment is a political, social, economic and spatial problem. Until recently, issues related to this area were covered in the Faculty of Architecture at Cracow University of Technology (FA-CUT) in the architecture study curriculum. The appearance of the study on spatial management at the FA-CUT resulted in the need to include housing environment in the curriculum of spatial management. Graduates of these studies are specialist engineers who will make important planning, economic and social decisions. They will have to cooperate with architects. A comparative analysis of the expected learning outcomes and methodology of teaching the subject *shaping the housing environment*, as well as diploma theses in this field allows demonstrating the convergence, differences and complementarity of knowledge and skills of graduates of both fields. In this article, the author outlines this issue on the example of programmes, course projects and diploma theses made at the FA-CUT in 2017-2019. The number of hours of theory and design studio, course duration, requirements and effects are compared and discussed.

INTRODUCTION

Housing environment design is a political, social, economic and spatial problem. Housing areas occupy the majority of developed urban areas. Having a place to live is one of the primary needs of every individual and housing shortages lead to nationwide crises [1]. Housing development decisions are made at the national and local level. Politicians, local government civil servants, and experts from various disciplines and branches of academia educated at various types of universities, among them planners, urbanists and architects - all participate in making these decisions [2].

Until recently, the shaping of the housing environment in terms of planning and design were a part of the curriculum of the Architecture course. The high demand for professionals with broad, interdisciplinary knowledge led to the establishment of a new university course in Poland, named Spatial Management. It was necessary to include knowledge of housing environment design in the new course's curriculum. It produces engineers prepared to make spatial and social decisions. They will also have to be able to cooperate with architects and urban designers.

As Hadgraft of the University of Technology Sydney wrote on the model of the future engineer:

> …*In the old model of curriculum design, one would make separate subjects or units for the future work skills, perhaps sending students to various faculties to learn these skills in the hope that they would see the connections and integrate the skills into a set of professional competencies. However, the past experience suggests that students do not see the value of a fragmented curriculum, preferring to forget anything that they needed to learn other than their major (engineering/IT) subjects. One needs a different approach that balances understanding the fundamentals with learning the process skills of engineering practice (systems engineering principles). One needs to educate for complexity. Students need to think in systems rather than assuming that there are textbook answers for simplified problems. Students will need a broad set of skills, as well as the ability to work effectively with many disciplines in order to address these complex, global challenges* [3].

The article quoted above defined the following elements of the teaching process: 1) investigation; 2) modelling; 3) design; 4) impact assessment, risk, sustainability; 5) planning and management; and 6) audit and compliance.

SPATIAL MANAGEMENT AS A UNIVERSITY COURSE

Spatial Management has been introduced as a course by many Polish universities, including technological, economic and pedagogic ones, including: Warsaw University's Faculty of Geography and Regional Studies; Gdańsk University's Faculty of Oceanography and Geography; Łódź University's Faculty of Economics and Sociology, and the Faculty of Geographical

Sciences. This course is also taught by technical universities, including Warsaw University of Technology's Faculty of Surveying and Cartography or Wrocław University of Technology's Faculty of Architecture. Universities with a focus on agriculture have also opened Bachelor's and Master's studies in spatial management. Curricula for this course are designed as per the educational outcomes stipulated in the Polish Qualifications Framework. When opening a new course, most faculties rely on their existing staff and the teaching profile depends on a given faculty's main focus. This is why some put a greater emphasis on economics, while others on geographical sciences or engineering sciences. However, most universities confer upon their graduates the degree of *inżynier* (Engineer - an equivalent to the Bachelor of Engineering), which obligates students to obtain competencies in engineering. The Polish name of the course is *Gospodarka Przestrzenna* and its translations vary, including such terms as Spatial Planning and Spatial Management.

Cracow University of Technology, by opening the Spatial Management course, decided to adopt a solution that is thought to be the best form of addressing contemporary needs of teaching engineers with a broad spectrum of interdisciplinary knowledge. The CUT's version is an inter-faculty course, taught by staff from three faculties: the Faculty of Environmental Engineering, which acts as coordinator, the Faculty of Architecture and the Faculty of Civil Engineering. Its official English name is the Inter-faculty Spatial Management Study Course, abbreviated as IFSMSC (SM). Its graduates receive the professional degree of *inżynier*, and after defending their Master's thesis - that of *magister inżynier* (equivalent to the Master of Engineering) in one of the following specialisations: spatial planning and municipal economy or urban planning and transport [4].

The first-tier studies (Bachelor's studies) graduate profile reads as follows:

> *Graduates of the Spatial management course possess interdisciplinary knowledge in the field of the spatial organisation of socio-economic development; the precepts and techniques of spatial planning; general knowledge of economics, the natural and social sciences, as well as specialist knowledge concerning the conditions, precepts and engineering of spatial planning, and the planning of technical and transport infrastructure development. Students of this course are taught the precepts of shaping the human environment in accordance with human needs, accounting for spatial order and the requirements of sustainable development; conducting spatial analyses, design and spatial planning. They gain the following skills: the ability to assess the environment and the impact of changes in land use and engineering projects on the environment; plan and design the development of engineering and transport infrastructure and the associated structures, primarily in the context of site-specific conditions, controlling changes in hydrological conditions and changes to ecosystems associated with water. They are to be prepared to use Geographical Information Systems (GIS) in interdisciplinary spatial analyses, in the process of the planning and management of space* [5].

The following characteristics are described in the second-tier studies (Master's studies) graduate profile:

> *The graduate possesses enhanced knowledge and analytical, creative and negotiation skills (including the ability to resolve conflicts) in the field of spatial management, particularly in the field of urban and circulation planning. This applies to the following fields: the theory and practice of urban planning; urban and regional governance, territorial marketing; legal conditions and procedures of drafting planning documents; cultural conditions and public participation in spatial planning; urban development planning methods, with a particular focus on their transport and logistics systems; protecting and shaping the environment, particularly the impact of transport; cultural heritage protection; modelling and forecasting using digital technologies (including simulation programs) in spatial planning, particularly in the transport sector; systemic management in spatial planning* [6].

A similar, if not identical, scope of knowledge and abilities is offered by the School of Spatial Planning and Development, hosted by the Faculty of Engineering at Aristotle University of Thessaloniki. The School of Spatial Planning and Development focuses on the organisation, operation and transformation of space, as well as the acquisition of professional competence such that the student will be able to draft plans for spatial interventions including urban and regional planning, spatial development planning, as well as the procedures relating to decision making and public consultation. At the same time, the curriculum will familiarise students with advanced methodological tools and techniques to analyse current situations, to make decisions and write, implement and evaluate programmes.

In order to reach these objectives the curriculum includes the following: urban planning, spatial planning, physical and human geography, management of geographic information, layout of human activities, spatial development, transport planning, natural resources management, project management, etc. These fields of study are necessary in the design and implementation of spatial interventions [7].

Spatial management graduates are expected to find employment in territorial government entities, real estate development companies and academic facilities - all entities which are involved in the development of space. The housing environment features prominently in this field. The course curricula and educational outcomes, in the form of diploma projects by architects and spatial management specialists, must feature common elements, although they should not be identical.

COMPARATIVE ANALYSIS

The educational outcomes of the Architecture course are outlined in Education Standards. The applicable version of the Standards was published in July 2019 in the Ordinance of the Minister of Science and Higher Education [8]. The detailed educational outcomes, as stipulated in the Ordinance, state that a graduate of second-tier architecture studies should, as a part of the design module, know and understand architectural design of various degrees of complexity, ranging from simple tasks to buildings with complex functions in a complicated context; urban design in terms of tackling problems of varying scale and degree of complexity; spatial planning and the tools of spatial policy; advanced analysis methods; the interdisciplinary character of architectural and urban design, and the need to integrate knowledge from other fields, including its application in design in cooperation with specialists from the said fields.

The graduate should also be able to design simple and complex buildings; design a simple or complex urban layout; draft planning documents; critically analyse site-specific conditions, including land development; formulate conclusions for design and planning; prognosticate transformation processes and foresee their social consequences; assess the utility of advanced methods and tools in solving simple or complex engineering tasks typical of architecture, urban design and planning, and to select and use proper methods and tools in design. The descriptions presented above indicate that both courses have overlapping elements, familiarity with which allows harmonious cooperation at the level of analyses, forecasts, assessments and strategies. The Architecture course has a much broader scope of design, while Spatial Management features a much broader economic, sociological and cultural context.

A comparative analysis of expected educational outcomes and teaching methodologies of the housing environment design module and of diploma projects focusing on the subject prepared at the Architecture and Spatial Management courses identified similarities, differences and complementarities in terms of the knowledge and skills of the graduates of both courses. Both courses offer their second-tier students an expanded curriculum concerning housing environment. The primary role of the module is to present approaches by identifying the role of a given area on the scale of its city and district, continuing urban systems, incorporation into context, improving the quality of an area as a whole, proposing a new area.

Students of both courses perform wide-ranging analyses across successive scales, including a SWOT analysis; they prepare a physical model that they use to begin their projects; they formulate conclusions and assumptions, conceptualise development, propose a programme for and the division of space, draft functional and compositional schemes, identify applicable elements of sustainability and perform an assessment of solutions.

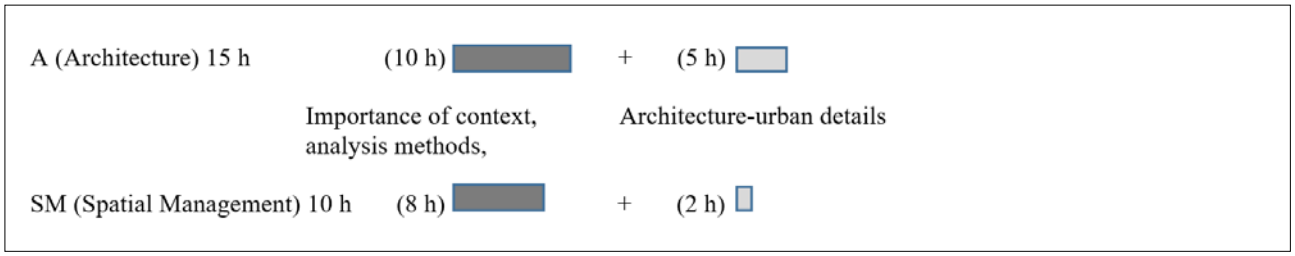
Considering all of a city's most important systems forms the basis for performing analyses and formulating development proposals. In their work, students use a typology of systems-infrastructures that should form the human environment in the spirit of sustainable development. Ken Yeang, a sustainable design theorist and practitioner proposed that such infrastructures include: a) green infrastructure: natural elements, natural corridors, open areas, flora and fauna habitats, terrain; b) blue infrastructure: water management, surface runoff management and retention; c) grey infrastructure: transport and technical services; and d) red infrastructure: the built environment, and political and social systems.

Students of the FA-CUT and SM are taught a modified curriculum, which also features brown infrastructure, comprised of development, while red infrastructure denotes social spaces and other elements associated with human activity. These infrastructures are analysed, then supplemented as needs and capabilities indicate, and then supported by precepts of sustainable design and familiarity with theoretical models. This provides students with a set of measures and tools that enables them to design and transform housing structures to the needs of contemporary and future generations [9].

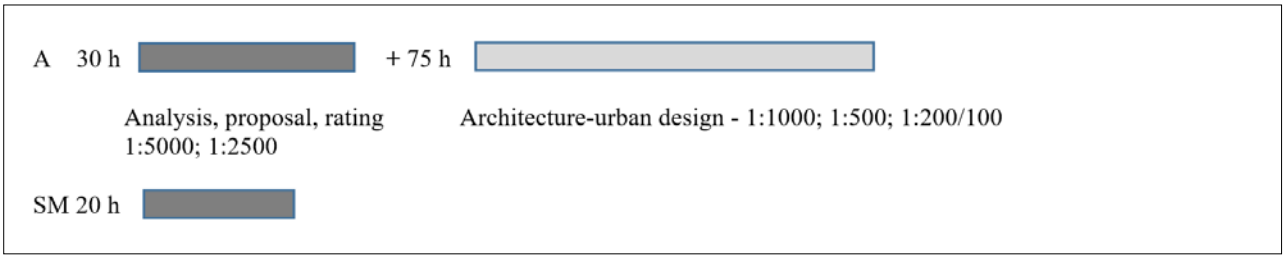
Spatial management students finish working on their projects by presenting the development potential of each infrastructure, working on scales ranging from 1:10000 or 1:5000, creating the structural and functional division of a housing area, drawn to a scale of 1:2500, and prepare and give a final multimedia presentation. Architecture students are given the same assignments, which culminate in a presentation, which is a staged review and is followed by a programmatic and spatial proposal of a selected fragment, drawn to a scale of 1:1000, accompanied by a physical model and architectural design with plan, cross-section and elevation drawings, dwelling solutions and sustainable solutions on the architectural scale. The design culminates in a presentation, either in multimedia form or delivered by using printed sheets.

A presentation of the similarities and differences in how both versions of the module are taught has been included below:

1. Theory/lecture module hours and thematic scope:



2. Design module hours and thematic scope:



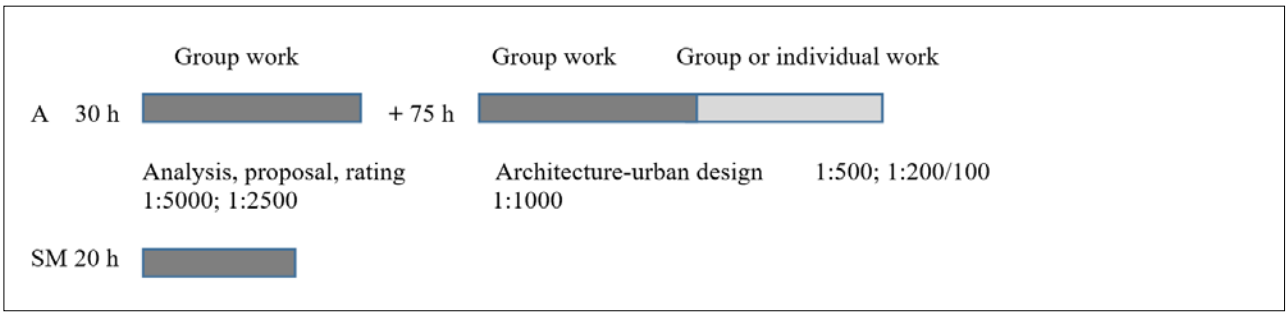
The previously presented scope of engineering knowledge and skills required of spatial management graduates demonstrates that they are not prepared to draft urban and architectural designs, but should be able to understand them and prepare in-depth analyses, define development directions, present a proposal draft that can be discussed with authorities, developers and architects.

This is the reason behind the final substantive scope, duration and presentation method of the entire module.

Both modules feature theoretical and design sections.

Group work plays an important role in both courses, allowing students to enhance their social competencies, which are necessary in their future professional careers.

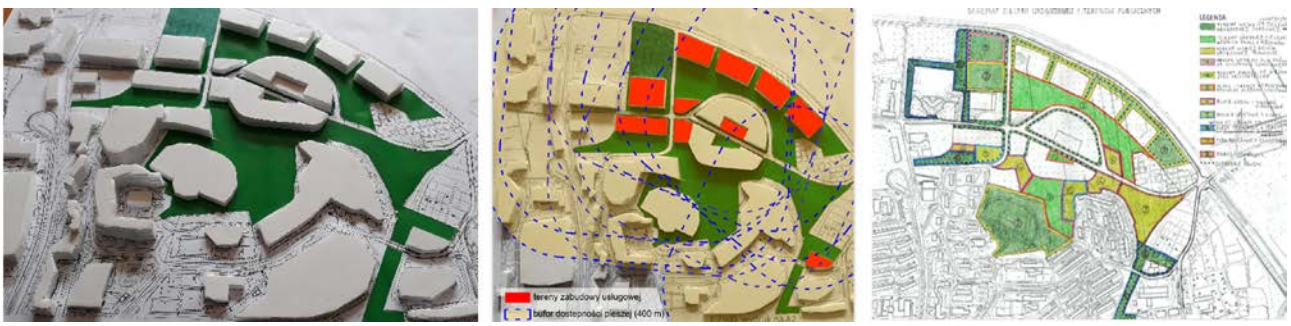
3. Forms of work:



Spatial management students work in two- to four-person groups from the analytical work stage and end their projects in group presentations. Architecture students begin work in two- to four-person groups and continue to do so up to the urban scale-focused stage of the project, i.e. drawn to a scale of 1:1000, 1:2000. The mode of work from 1:500 scale stage to the architectural scale stage is up to the students. Some groups work together until the end and prepare their presentations together, while others prepare fragments of architectural solutions individually.

The figures below present examples of the scopes of projects prepared for the architectural and urban design of housing areas module and the housing environment module. Projects prepared during the same academic year and for the same site in Mistrzejowice, Kraków, were presented for comparison.

The projects were prepared by students under the supervision of the FA-CUT Chair of the Housing Environment staff (Professr G. Schneider-Skalska, and architects: P. Tor and P. Celewicz).



a) b) c)

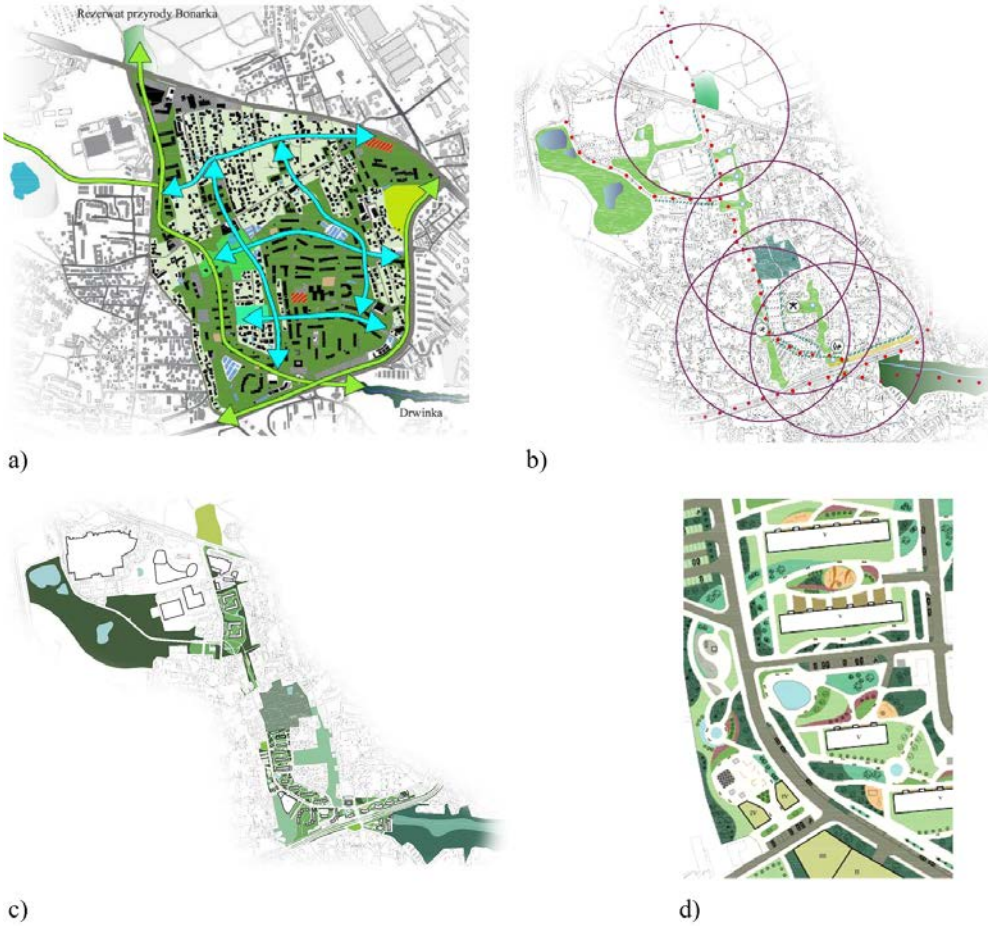
Figures 1: Selected fragments of a project prepared by SM students - presenting the working model as the primary tool in design and land use analysis (Students: A. Potempa and M. Busz Wesołowski, 2018/19).

a) b) c)

Figures 2: Selected fragments of a project prepared by architecture students - analytical and conceptual sketches, working model - the scope is similar to that of SM projects (Students: W. Siedlarz and K. Sanak 2018/19) in addition to urban and architectural design solutions.

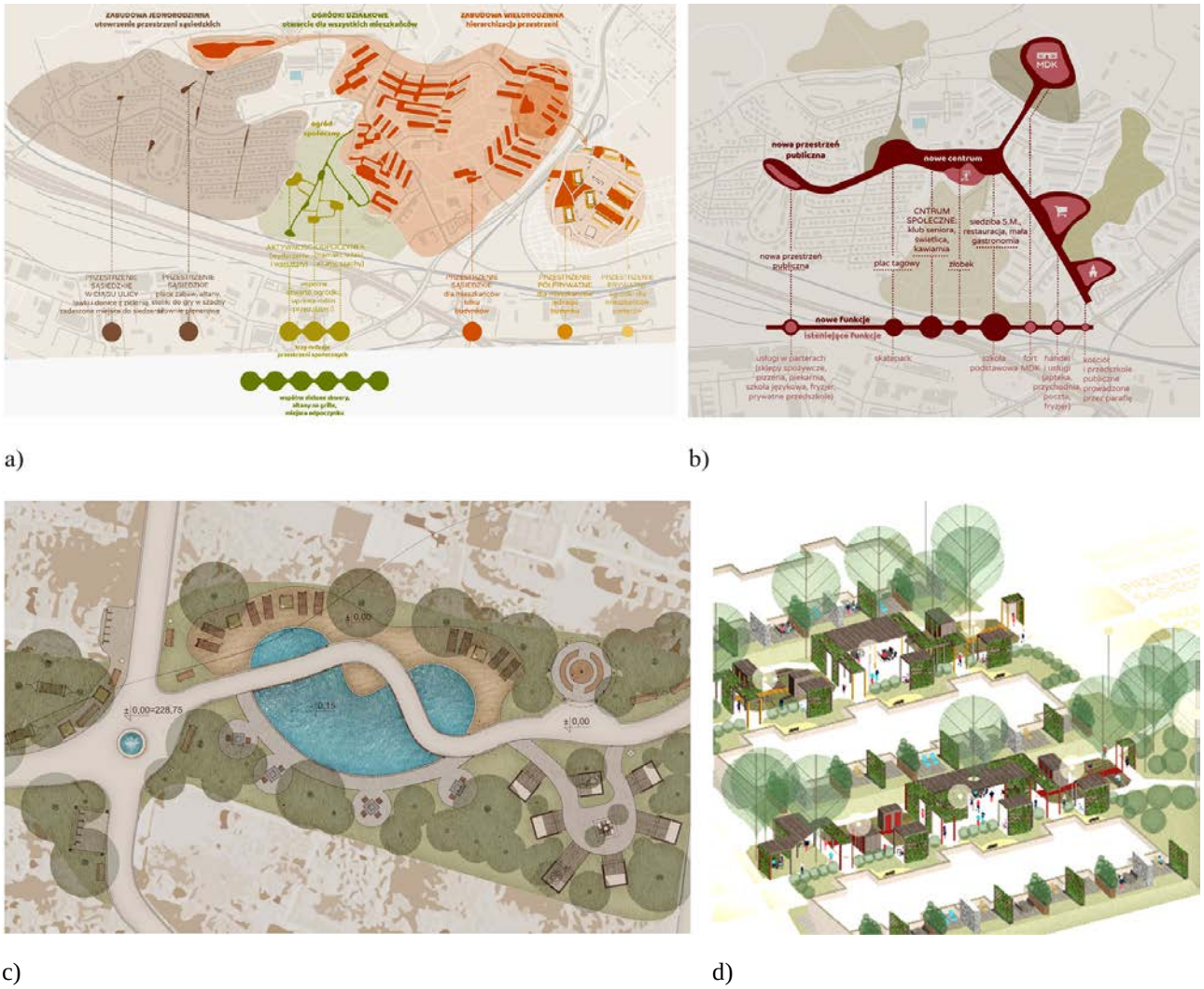
Some students of both courses select diploma project subjects that are associated with housing environment design. The principle of assembling the content of a diploma project is similar to that of the course discussed above. Diploma projects present solutions to problems related with both science and design, across various scales and scopes.

The project scope for SM students includes in-depth analyses, development strategies (with a comprehensive written section) and conceptual proposals (often featuring alternatives), presented on urban scales. Due to the comprehensiveness and broad scope of urban projects, diploma candidates often decide to work in two or three-person groups.



Figures 3: Selected elements of the *Restructuring of the Wola Duchacka Wschód district, with particular emphasis on the system of public spaces as well as greenery and recreation*, diploma project, by S. Stokłosa and A. Smajdor (Space Management). The drawings present the scheme of an approach to activating public spaces, greenery and recreation systems, delineating activity nodes within the *green* system and its urban development and detail, drawn to a scale of 1:500 as the final design element (Prepared under the supervision of G. Schneider-Skalska and P. Tor).

Diploma projects prepared by future architects contain less in-depth analyses and feature urban and architectural proposals with a comprehensive design section.



a) b)

c) d)

Figures 4: Selected elements of the *Wzgórza Krzesławickie - integration* diploma project by K. Gilek and J. Janowiec, FA-CUT (Prepared under the supervision of G. Schneider-Skalska and P. Tor).

The aim of the project was the revitalisation and rehabilitation of the housing estate Wzgórza Krzesławickie, located on the outskirts of Kraków. The proposed solution integrates various parts of the housing estate among themselves, and creates a homogeneous and multifunctional unit, additionally equipped with the most important and complementary functions. In addition to extensive analyses and proposals on the urban scales, the authors proposed a number of detailed solutions for new architectural objects and new public and recreational spaces.

The drawings presented above (Figure 4) show an analysis of the structure of a housing estate, a conceptual scheme of its system of public spaces and greenery sequences along with nodal sites, in addition to a design section drawn to a scale of 1:200 and presented in three dimensions.

CONCLUSIONS

Housing environment, as a complicated functional and spatial structure, is a subject that is relevant to the teaching of engineers who will formulate spatial development strategies (SM), and design specific urban and architectural solutions (A).

Housing areas occupy the most of any city in terms of area. The quality of functional and spatial solutions within these areas defines the quality of life and is a challenge faced by the graduates of both courses, who will have to face the problem of expanding housing areas throughout their careers.

The course comparison presented in this article demonstrates that students of both courses are equipped with the knowledge and skills that will allow them to understand their partners and cooperate in the design of housing areas during their professional careers.

The shared curriculum for both courses includes broad analyses, modelling and comparisons of alternative proposals as needed and recommended, understanding scale and spatial expression, the necessity and use of sustainable solutions and the presentation and assessment of proposals. It is aligned with the teaching elements listed by Hadgraft [3].

It appears possible for students of both courses to work together on the first stage of analytical and research work, perhaps as a part of working on their diploma projects, with support from consultants from various fields.

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