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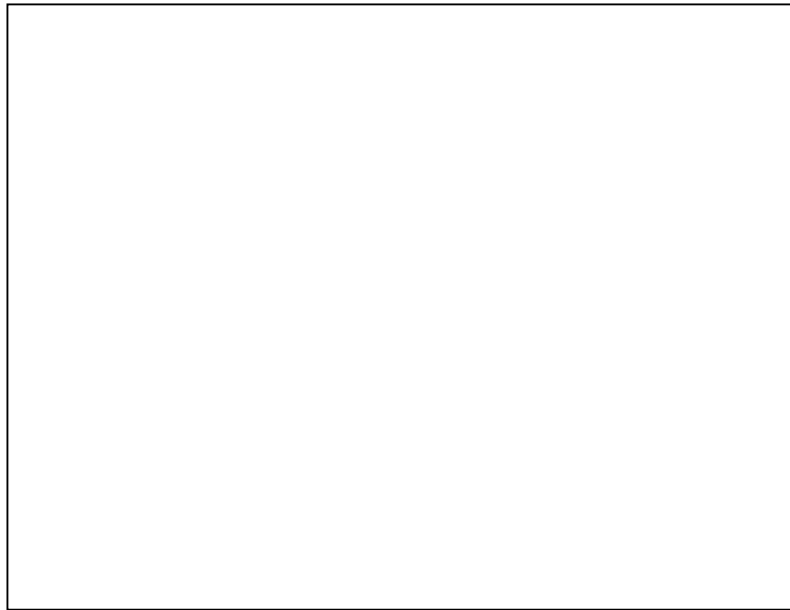
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Jelena Živković¹, Ana Nikezić²

INTEGRISANJE KONCEPTA ZELENE INFRASTRUKTURE U OBRAZOVANJE U DOMENU URBANOG DIZAJNA

Rezime

Savremeni pristupi razvoju gradova prepoznaju multifunkcionalnu zelenu infrastrukturu kao jedan od ključih alata za ostvarenje održivog urbanog okruženja kojim se istovremeno ostvaruje korist i za ljude i za prirodu. Primena ovog koncepta u urbanom planiranju i dizajnu zahteva holističko razumevanje kompleksnih odnosa u urbanim socio-ekološkim sistemima, kao i multidisciplinarni i multi-skalarni pristup razumevanju, vrednovanju i transformaciji prostora. To stvara potrebu za razvojem novih znanja i veština, kao i za novim pristupom obrazovanju arhitekata i urbanista.

Ovaj rad prikazuje teoretske osnove i metodološki pristup integraciji koncepta zelene infrastrukture u nastavu u oblasti urbanog dizajna i ilustruje njegovu primenu na primeru studio projekta "Ekološki urbani dizajn" na Master akademskim studijama arhitekture na Univerzitetu u Beogradu - Arhitektonskom fakultetu.

Ključne reči

zelena infrastruktura, urbani dizajn, obrazovanje arhitekata i urbanista, nastava u studiju

INTEGRATING THE CONCEPT OF GREEN INFRASTRUCTURE INTO URBAN DESIGN EDUCATION

Summary

Current approaches to urban development recognize multifunctional green infrastructure as one of the key tools for achieving a sustainable urban environment that simultaneously serves interests of both people and nature. The application of this concept in urban planning and design requires a holistic understanding of complex relationships in urban socio-ecological systems, as well as a multidisciplinary and multi-scalar approach to understanding, valuing and transforming space. This creates a need for the development of new knowledge and skills, as well as for a new approach to the education of architects and urban planners. This paper presents the theoretical foundations and methodological approach to the integration of the concept of green

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infrastructure in urban design education, and illustrates its application on the example of the studio unit "Ecological Urban Design" at the Master of Architecture program of the University of Belgrade - Faculty of Architecture.

Key words

green infrastructure, urban design, urban design education, studio-based learning

1. INTRODUCTION

The challenge for architecture and urbanism today is to help build and develop more resilient, vital and healthy cities in which people and nature can flourish together. One of the concepts that have recently been widely recognised as important for reaching this goal is the concept of multifunctional green infrastructure (GI). It refers to a natural spatial structure that aims to enhance nature's ability to deliver multiple ecosystem goods and services that provide variety of environmental, social and economic benefits.

The application of GI concept requires changes in how architects, planners and urban designers perceive, understand and evaluate contexts, types and effects of urban spatial interventions. It asks for holistic understanding of complex relationships in urban socio-ecological systems that need to be addressed by different disciplines and at different spatial scales.

This creates a need for the development of new knowledge and skills among professionals, and for a new approach to education of architects and urban planners. In that context, urban design education needs to be transformed so as to simultaneously help development of the professional and ecological knowledge, skills and awareness. There is a growing body of research focused on exploring possible ways to transform urban design education towards sustainability [1]; [2]; [3]), but it is still little known about its relation to application of GI concept.

This paper aims to contribute to this line of the research by presenting and discussing the pedagogical concept and the results of Ecological Urban Design Studio at Master of Architecture program at the University of Belgrade Faculty of Architecture that aims to integrate GI concept into design education. The work in studio builds upon theories and principles of ecological urbanism, and uses place based and student centred approach to help students gain knowledge, skills and abilities for designing ecologically sound urban environments through application of GI elements and systems.

2. WHAT IS GREEN INFRASTRUCTURE?

Green infrastructure is a natural spatial structure that serves the interests of both people and nature. Although application of green networks and systems have long tradition in urban and regional planning, the concept of green infrastructure emerged as new way of thinking about what landscapes should be in terms of their form and function in relation to people, society and development. Progressing from previous concepts that mainly focused

on conservation of nature, the underlying assumption for green infrastructure is that „it offers possibilities for harmonising the environment costs of human activities“ [4].

There are many definitions of the GI concept, but widely accepted is formulated in EC Green Infrastructure Strategy [5] that defines Green Infrastructure (GI) as *“a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. On land, GI is present in rural and urban settings.”* GI comprise of „all natural, semi-natural and artificial networks of multifunctional ecological systems within, around and between urban areas, at all spatial scales“ [6]. The elements of GI differ in relation to scale, and span from forests, regional parks, rivers and floodplains etc., at regional level, to street trees, hedges, ponds, green roofs and walls, etc. at local site scale.

This means that GI concept integrates two important dimensions – it is at the same time **multifunctional and multiscalar** [7]. Multifunctional character of GI planning and management is based on its purpose to enhance nature’s ability to deliver multiple ecosystem goods and services that may contribute to sustainable development by providing variety of environmental, social, biodiversity as well as climate change and adaptation benefits. As such, multifunctional GI stands in contrast to usually mono-functional ‘grey’ infrastructures.

Multiscale character of GI planning, as Ahern suggests [8], builds upon landscape ecology, and apply key principles of landscape ecology to urban environments. In developing GI as a coherent ecological network, different types of green areas at various spatial levels (local, regional, national, international) are linked, and special attention is paid to pattern - process relationships, as well as on their physical (spatial) and functional connections.

Conceptualised as a tool to serve and harmonise the interests of both people and nature, GI is supposed „promote **place-based** approaches to conserve, protect, restore, and manage local and regional networks of natural living, and environmental resources and amenities“ [9]. In that sense, GI planning and design is based on holistic understanding of the complex interrelations and dynamics of **socio-ecological systems**, and assumes interdisciplinary and multi-scale approach, thus creating a new challenges to planning and design professions and academic education.

3. HOW TO INTEGRATE THE CONCEPT OF GREEN INFRASTRUCTURE INTO URBAN DESIGN EDUCATION FOR SUSTAINABILITY?

Urban design is a process and a product of designing man-made environment by creating connections between people and places, nature and urban fabric, urban movement and urban form [1]. In that context, the purpose of urban design education is to help student develop awareness, knowledge, skills to understand and value urban spaces, and to design them as places for people and nature.

Although GI can be planned and applied at both regional and local (city/town/village) level, the latter is the focus of urban design education. In order to enable the integration of GI concept, the focus of urban design teaching and learning activities should be on developing student's abilities to understand the importance, purpose and prerequisites for GI application, and to design and evaluate integrated UD interventions at relevant spatial scales.

In relation to knowledge, the purpose of integrating GI into UD education is to help development of future professionals that have knowledge and awareness on general GI related concepts, processes and benefits.

Students should be capable to understand complex socio-ecological relations and processes in built environment and on how can ecosystem services and nature-based solutions, as implemented through GI, contribute to sustainable development, nature conservation and biodiversity in human settlements.

They should acknowledge the variety of benefits from GI planning and development in key areas of benefits that include: a) environmental quality (air quality, temperature and water regulation; erosion and noise reduction...), b) support of biodiversity; c) provision of food, fibre; and d) quality urban living (recreational experiences, social interactions, aesthetic qualities...).

Students should learn on possibilities for implementation of GI at different spatial scales (city/metropolitan, neighbourhood, site/building level).

Urban design education should also help students develop skills to plan and design context-specific, integrated and sustainable solutions by including connected and multifunctional GI elements into architecture/urban design projects in a knowledge-based, socially aware, and creative manner. In that context, interdisciplinary and systems approach, as well as widening of the knowledge base to include local lay knowledge and values, are important to help students understand how natural and cultural heritage may guide their context-specific and appropriate design solutions.

Additionally, the character of GI as a place-based, multi-scale and multifunctional concept makes necessary that students develop specific thinking skills. GI planning and design is based on revealing and understanding complex relations between nature, people and society, and for that reason, students will benefit from developing **systems thinking** skills. According to Arnold and Wade [11] *"systems thinking is a set of synergistic analytic skills used to improve the capability of identifying and understanding systems, predicting their behaviours, and devising modifications to them in order to produce desired effects."* From this perspective: *"the future can't be predicted, but it can be envisioned and brought lovingly into being. Systems can't be controlled, but they can be designed and redesigned"* [12]. Integrating the systems thinking and design thinking helps to encourage learning and innovative systems change.

Besides that, in order to be able to appropriately integrate GI concept into planning and design practice, professionals and students should develop critical thinking skills. According to Gleaser[13], the ability of **critical thinking** involves: 1) the ability to consider in a thoughtful way the problems and subjects, 2) knowledge of the methods of logical inquiry and reasoning and (3) skill in applying those methods. More precisely: *"Critical thinking calls*

for a persistent effort to examine any belief or supposed form of knowledge in the light of the evidence that supports it and the further conclusions to which it tends” [13].

Taking all of this into account, learning/teaching process and activities should help students develop new thinking, communication and design skills to enable them to appropriately integrate GI in urban design projects, while at the same time supporting their authenticity and creativity. Therefore, as for environmental education in general, **student-centred** pedagogical approach can be considered as the most appropriate. It encompasses teaching methods that shift the focus of instruction from the teacher to the student. From this perspective, students are not only passive recipients of information but "active" actors in educational process. Student-centred pedagogies are collaborative efforts in which both teachers and students are actively engaged in the content and process of learning [14].

Although different learning environments are appropriate for learning on GI, **place-based pedagogies** are most favourable for design studio formats. This means that while learning on GI concept, related processes and possible design strategies can be performed in class environment, specific learning value will be provided from the different forms of on-site learning (field work and contact with local communities, etc.). Place-based education builds upon natural and human geographies of place to create authentic, meaningful and engaging personalized learning experiences for students. It is situated in places, promote learning rooted in local conditions, and use local surroundings as a context to integrate curriculum into wider society ([15]; [10]).

Integration of GI in urban design education implies not only changes in teaching and learning pedagogies, but also changes in relation to **teachers’ competences**. In order to effectively educate students on concept, purpose, elements and benefits from GI, and help them acquire the appropriate skills, teachers should develop specific competences. They should be capable to organise and moderate the collaborative work so that students can develop skills to work in interdisciplinary environment and with local communities. In addition, besides having traditional pedagogical competences to clearly convey knowledge or to initiate debates, teachers should be able to function as trainers/coaches in the student-centred design studio. Finally, since the knowledge about GI elements and application is constantly evolving, teachers are supposed to be lifelong learners and reflective agents, as well as innovators in transferring knowledge and skills to students.

Next section presents possibilities for application of abovementioned methodological approach on the example of the “Ecological Urban Design Studio” from UBFA Master of Architecture that aims to integrate GI concept into design education.

4. APPLICATION: „ECOLOGICAL URBAN DESIGN STUDIO“

4.1. EUD STUDIO_PEDAGOGICAL CONCEPT

The „Ecological Urban Design Studio“(EUD) is based on the premise that the ecological urbanism draws from ecology to inspire urbanism that is more socially inclusive and sensitive to the environment. It seeks for new ethics and aesthetics of the urban [2]. Being part of Master of Architecture education at University of Belgrade Faculty of Architecture – the EUD study unit is conceptualised to enable students to acquire complex

and deep awareness, knowledge, skills to design place based ecological urban design project. It is organised in 3 inter-related modules: project, seminar and workshop, and encompasses theoretical and practical lessons and tasks for group and individual work of students.

It applies place based and student-centred pedagogical approach. EUD Studio applies thematic approach to urban design in which place-related values or environmental issues are leading the choice of the theme. Studio is organised as a complex system of abstract (theoretical) and experiential learning cycles. Pedagogical process (Figure 1) combines research, design and reflection phases that weave together to help students produce design project at different spatial scales, as well as to gain wider knowledge, skills and awareness on how can urban design and environmental issues (such as GI development) be integrated [16].

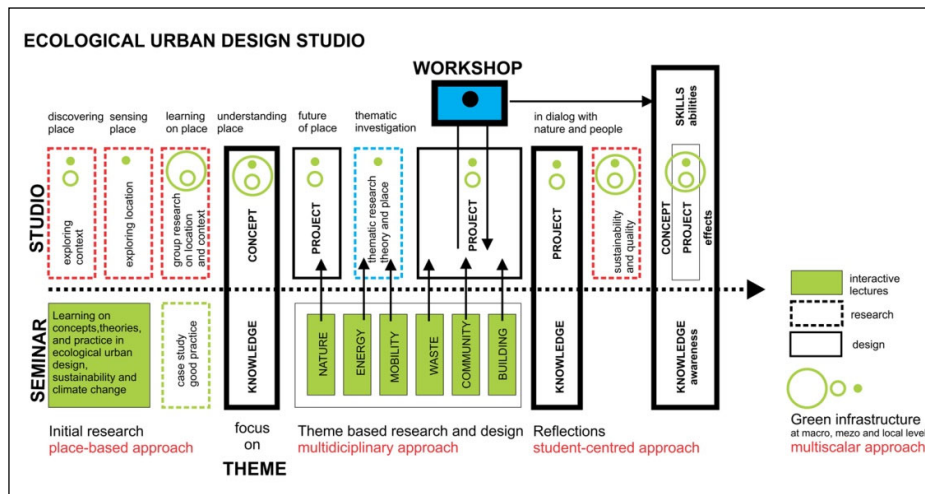


Figure 1. Pedagogical model for EUD studio. Author: Jelena Živković

Structure and process of Study Unit EUD makes place-based, multidisciplinary and multi-scalar approach to GI research and development possible, by combining seminar, workshop and project formats. During the educational process, students acquire and share GI related knowledge through thematic lectures conducted by multidisciplinary team of lecturers, study of good practices, and individual and group research on GI related elements in specific context. Besides that, through variety of pedagogical activities, students are enabled to develop systems and critical thinking, as well as GI planning and design skills. In addition, during both research and design phases, multi-scale approach is applied, and students are encouraged to conceptualise and develop their design projects as part of wider socio-ecological systems. Next section illustrates the application of this pedagogical model by showcasing one student's EUD research and design project.

4.2. EUD STUDIO_ RESULTS

The location for Ecological urban design studio in 2018/19 was Block 70a in New Belgrade, a modernist mass housing area near the Sava River. Building units of the Block gather around centrally located public open spaces, characterised by the high quantity of underused and neglected green spaces. Therefore, the purpose of the studio research and design project was to investigate possibilities for developing multifunctional public open space system, as a place where nature and culture connect, overlap and permeate, in order to contribute to sustainable development of „Block 70a“.

Project “PLAY nature” (student: Ana Simić) explores the potential of local public open spaces to serve both people and nature by focusing on the concept of play. Play is here understood as both integrative activity and playful environment that motivates people to use and interact *in and with* nature. Led by theoretical, contextual and thematic research, the author develops an urban design intervention as a socio-ecological system of play that integrates variety of GI elements. The outputs of the EUD pedagogical process, in the form of urban design and workshop projects and reflective process-folios (Figure 2), clearly demonstrate the capability of the student to design multifunctional public open spaces conceptualised as part of wider system of green infrastructure.

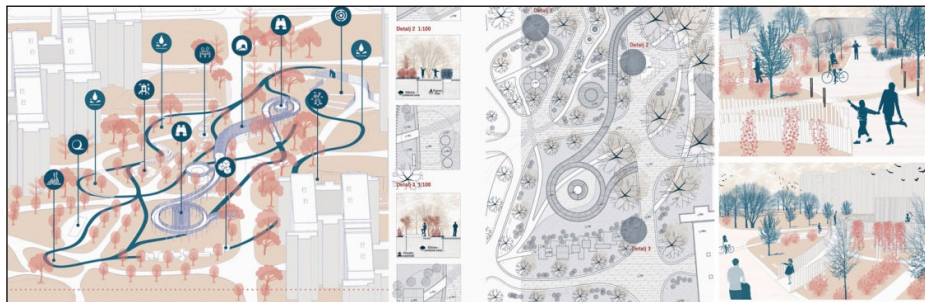


Figure 2. Project „PLAY nature“: concept, system, elements. Author: Ana Simić

5. CONCLUSION

Being widely recognised as important for sustainable urban development, the concept of multifunctional green infrastructure needs to be integrated into urban design theory, practice and education. Its appropriate inclusion in the education of future professionals depends on exploring how the key characteristics of the GI concept may be linked to the pedagogical approaches, knowledge and skills that students should acquire.

As examined on the case of Ecological Urban Design Studio, if based on place-based and student centred pedagogical approach, tripartite structure (project, seminar, workshop) of UBFA Master of architecture studio unit, proves to provide a good basis for integrating multiscalar and multifunctional concept of GI into architecture and urban design education in a knowledge based, systemic and creative way.

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